DOCUMENT RESUME

ED 065 724 VT 016 235

TITLE	Agricultural Service Jobs. World of Work.
INSTITUTION	Wisconsin State Employment Service, Milwaukee. Occupational Analysis Field Center.
REPORT NO	Ser-1150-2-71-WSES-3174
PUB DATE	[71]
NOTE	58p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Agribusiness; Agricultural Education; *Agricultural Occupations; Agricultural Production; *Agricultural Technicians; *Career Choice; *Occupational Information; Producer Services; Service Occupations
IDENTIFIERS	Career Awareness

ABSTRACT

To aid in selection and placement of people for vocations in agribusiness, this brochure presents occupational information about a wide variety of service-oriented jobs, including artificial breeding, conservation, marketing, and veterinary medicine. Collected and reported by a research analyst, the materials focus on services related to Midwestern agricultural production. A job index relates titles used in this pamphlet to those used in the Dictionary of Occupational Titles. Photographs illustrate the text. (AG)

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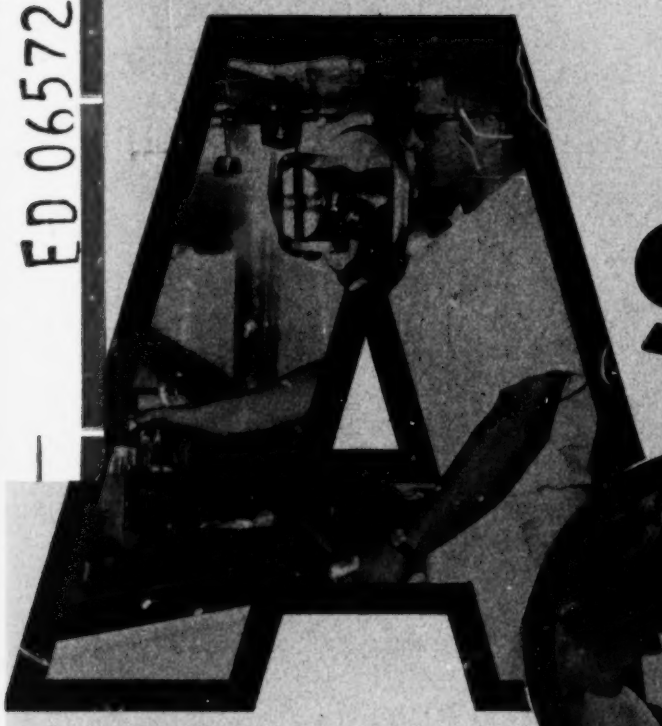

Agricultural Service Jobs

VT016235

WORLD OF WORK
OCCUPATIONAL ANALYSIS FIELD CENTER
SERIES 1150-2-71 WSES 3174

About the cover...

The three photos on the front cover depict three agricultural service jobs. Within the "A" is a Milk Hauler picking up a load of milk for Wisconsin Dairies. In the "S" is an Office Girl tending a piece of sophisticated business equipment at American Breeders Service. The "J" shows a Soil Scientist in the Soil Conservation Service performing a soil test as the farmer looks on.

NOTICE

Job titles found in this brochure are plant titles most often used within the industry, and may differ from those in the D.O.T.[1/] Persons engaged in counseling, interviewing, or related activities who wish to utilize corresponding data within the D.O.T. may use the conversion table located on the Job Index page.

1/ U.S. Department of Labor, Dictionary of Occupational Titles, Third Edition, Volume II, Washington: U. S. Government Printing Office, 1965.

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Prepared by the

OCCUPATIONAL ANALYSIS

FIELD CENTER

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MADISON, WISCONSIN 53705

* * *

Wisconsin State Employment Service

A Division of the Department of

INDUSTRY, LABOR AND HUMAN RELATIONS

ACKNOWLEDGEMENTS

The information contained in this publication was collected and reported by Russell Heilman, Research Analyst, under the supervision of William Miller, Chief of the Occupational Analysis Field Center of the Wisconsin State Employment Service.

We gratefully acknowledge the cooperation and assistance given us by the managements and staffs of the private companies and the governmental agencies that we visited. Without such cooperation the gathering of occupational data would be impossible and booklets such as this could not be prepared.

Special thanks are extended to those who provided graphic materials and to those who allowed us to take photographs to illustrate this publication. Special thanks are also extended to Dr. Robert Walton, President of American Breeders Service, Inc., DeForest, Wisconsin, and his staff; Mr. Fay Meade, Administrator, Wisconsin Farm Bureau Federations, Madison, Wisconsin; Dr. Bernard Easterday, Chairman of the University of Wisconsin Department of Veterinary Science, Madison, Wisconsin, and Mr. Russell Hvam, General Manager of Equity Cooperative Livestock Sales Association, Baraboo, Wisconsin, who were particularly helpful in the preparation of these materials.

FOREWORD

The Agriculture and Agricultural Service Industry is vast and contains hundreds of jobs. It includes the raising of crops to be used as food for people or animals, for industrial use such as raising cotton for textiles; and the breeding and raising of poultry, livestock, and other animals for food, fur or hides, for show or utility purposes, or for pets.[1/] Activities of a professional nature such as agronomy and entomology are not included.

The magnitude and diversity of the entire industry make the presentation of meaningful information covering the entire industry in a single publication impracticable. Therefore, the study of this industry has been divided into segments to facilitate the presentation of the information. Already published is Beef and Dairy Cattle Raising Jobs. Future segments are planned to include Fruit and Vegetable Raising; Hog, Sheep and Poultry Raising; and others.

These segments of the series have been selected as being significant in the Midwestern states and therefore do not include all agricultural products. It should also be noted that though every effort has been made to typify the information so as to provide maximum usage, conditions do differ to such an extent that certain areas of information may not precisely describe a given location or process. Caution must therefore be exercised in the use of such material.

Additional details relative to the jobs in this industry are available through local State Employment Service offices throughout the nation.

1/ U.S. Department of Labor, Dictionary of Occupational Titles, Third Edition, Volume II, Washington: U. S. Government Printing Office, 1965.

INTRODUCTION

This publication has been developed to aid the selection and placement techniques required to obtain the maximum utilization of human resources. The material presented has been collected through research, observation, and interview. The jobs included are those which are found in establishments that provide services directly to farmers. These include jobs found in artificial breeding services, the Soil Conservation Service, feed and grain mills, and many other such establishments whose primary purpose is to make available services needed for agricultural production.

Many of these jobs don't fall within the defined limits of the Agriculture and Agricultural Service Industry but they have been included to give a wider view of the services available to the farmer. In nearly every case these jobs require a background or special training which is agriculturally based. This ties them to the industry and makes them of special interest to those young people raised in rural America who wish to pursue an agriculturally oriented career other than agricultural production itself.

There are many jobs that provide valuable services to the farmer in the area of scientific research and development. The jobs of these scientists are not included however because their relationship to the farmer is an indirect one. There are other jobs also that are not included for the same reason.

If the jobs included in this publication all centered around one product or process they could be organized in relation to that product or process flow. Since there is no such unifying element, other than the farmer, who is the object of the services, the chapters have been arranged in simple alphabetical order.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS i

FOREWORD ii

INTRODUCTION iii

	CHAPTER	PAGE
I	AGRICULTURAL PRODUCTION SUPPLY *Jobs in retail sales of feed, seed, chemicals and other farm supplies.*	1
II	ARTIFICIAL BREEDING *Jobs in the processing of semen for artificial insemination.*	5
III	DAIRY COW TESTING *Milk sampling and testing jobs.*	13
IV	EQUIPMENT SALES AND SERVICE *Jobs in sales and service of farm machinery.*	17
V	EXTENSION EDUCATION *The jobs of the county extension agents.*	22
VI	MARKETING SERVICES *Jobs in the marketing of milk and livestock.*	28
VII	SOIL CONSERVATION SERVICE *Soil, water and resource conservation jobs.*	36
VIII	SOIL TESTING *Lab jobs in the analysis of soil samples.*	40
IX	VETERINARY MEDICINE *The job of the large-animal practitioner.*	44

JOB INDEX 47

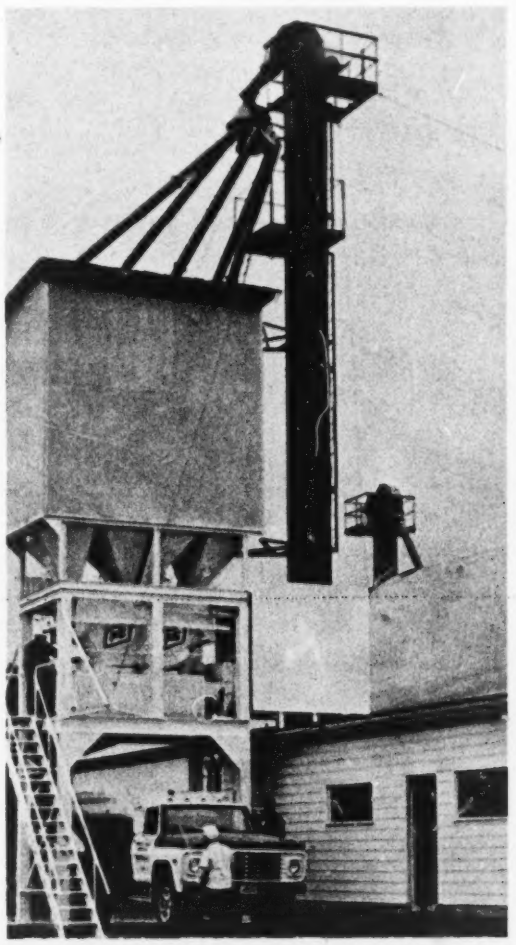
PHOTO CREDITS 50

I. AGRICULTURAL PRODUCTION SUPPLY

INTRODUCTION

Agricultural production supply is simply the marketing of supplies needed by the farmer for agricultural production. This marketing is exemplified by the local farmer's co-op or independent feed and grain mill. In the days when farmers saved a portion of their crops for the next season's seed, used natural fertilizers if any, and used hay to fuel their horsepower rather than gasoline, there was no need for an establishment to sell seeds, fertilizers and petroleum products or the multitude of other products available at such establishments today.

In sharp contrast to yesterday's mill that did little more than grind farmers' grain for feed, today's mill carries a wide range of products: feeds, feed supplements, fertilizers, herbicides, pesticides, seeds, hardware, petroleum products, and automotive supplies. It also mills feed, of course, and may offer grain drying and storage services, custom application of anhydrous ammonia, soil testing and fertilizer mixing.



Mechanical loading of a bulk feed truck.

ORGANIZATION

The facilities of a typical feed mill include the grain elevator, a warehouse, an automobile service station, a store, and the administrative offices. The grain elevator is where the farmers' grain is ground and the feed supplements are added. The warehouse holds bags of seed, fertilizers, chemicals and other supplies. The service station sells gas to nonfarmers as well as to farmers and carries some automotive supplies such as tires and batteries. The store is where the business transactions take place and where the farmer can purchase livestock health products, hardware, tools and other work aids.

One of the additional services sometimes offered is the custom application of anhydrous ammonia in the spring of the year. Another is drying and storage of grain; the storage can be under a number of arrangements. Some take soil samples and recommend fertilizers.

A Truck Driver loads his truck with fuel oil for delivery.

OUTLOOK In recent years there has been a move toward fewer but larger feed and grain mill operations. The small, independent operator has been finding it increasingly difficult to make a profit with his costs rising as they have been. Many of these independents have been, and continue to be, consolidated into larger state-wide and multistate organizations. These multiple unit operations can cut costs by consolidating administrative operations, controlling sources of supply, and by purchasing and transporting goods in large quantities.

In some areas farmers are moving to grain drying and milling on-the-farm due to developments in machine technology which make this equipment more easily available to farmers thus decreasing the demand for these services at the mill.

Due to the increasing complexity and sophistication of equipment and the increasing variety of products and ingredients, the educational levels required in this area of jobs are increasing. Particularly in the jobs where more judgement is involved, it is becoming increasingly important that the workers have a good understanding of the processes involved and the materials used to prevent errors that could be costly.

The Clerk is weighing a truck loaded with corn on the scale outside the window.

JOBS AND PROCESSES When the farmer comes to the feed mill with his load of grain for grinding into feed he first stops at the scale where the CLERK weighs the load. This enables the MILLMAN to determine the amounts of feed supplements to add to achieve the final percentages desired by the farmer. The farmer then drives his truck to the elevator where the grain is dumped down into the grinder. From the grinder it is conveyed to the mixer where the MILLMAN adds the supplements by pouring them from a bag or using a hand scoop. After a period of mixing, the feed is discharged into feed bags held under a chute opened by pulling a lever. The bags are then loaded onto the farmer's truck at the shipping dock.

From there the farmer may go to the warehouse to pick up some calf feed, chemicals, or other supplies which the WAREHOUSEMAN locates and loads onto his truck. Or if the farmer desires, the WAREHOUSEMAN may load the bags of seed, feed, or chemicals onto a company truck for delivery to the farm.

This Truck Driver is loading his truck with feed for delivery to a farmer who may have ordered it through a company Salesman.

The farmer then goes to the store where he pays for his goods or makes arrangements for credit with the CLERK. While he is there he may select some hand tools, livestock health aids, or other small items.

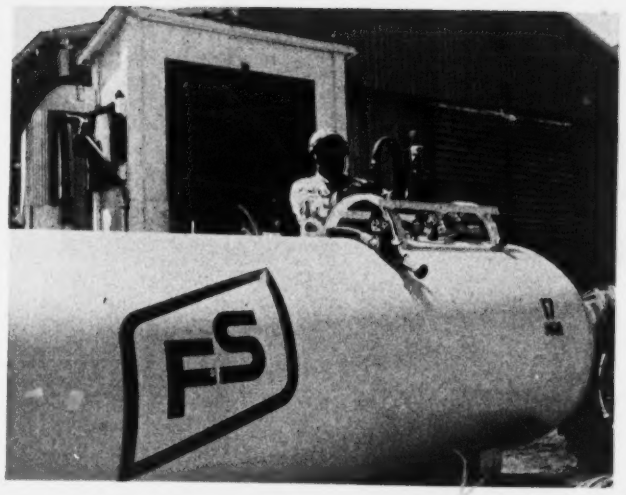
Before driving back to his farm he may stop at the service station and have the ATTENDANT fill his gas tank while he looks over the selection of tires, batteries and other automotive supplies that the station sells.

Here a bulk fertilizer trailer is being filled with a particular fertilizer blend.

While he is returning to his farm his sales ticket is going through a number of processes in the office where the clerical staff are recording and filing the needed information for inventory, billing, and the like.

There are additional services the farmer can receive without going to the mill. A SALESMAN visits the farm regularly to answer any questions on his products and to take orders. The farmer can then have these items, such as seed, feed, chemicals, fuel oil, bottled gas, and gasoline, delivered to his farm by the company TRUCK DRIVERS, thus saving himself a trip to the mill.

During the spring of the year the company hires part-time FARM EQUIPMENT OPERATORS to operate the equipment used in the application of anhydrous ammonia to the farmers' fields. This is also the time when the farmer takes samples of the soil in his fields. The company has these samples tested to determine the fertility needs of the soils in order to make recommendations for supplements of organic matter and fertilizers.



Filling an anhydrous ammonia tank.

ENTRY LEVEL QUALIFICATIONS

The primary qualification for Agricultural Production Supply jobs is a farm background. This is necessary because a basic understanding of agriculture and agricultural products is needed. A high school education is not always needed but it is preferred. Training is of the on-the-job type. Managers and Salesmen receive additional training at company sponsored programs in the larger organizations.

Delivery of bulk feed on the farm.

II. ARTIFICIAL BREEDING

INTRODUCTION The availability of breeding services has proven to be one of the most important factors in the development of today's dairy and beef cattle herds. Through breeding services the best bulls are made available at a reasonable price to dairymen and cattle ranchers throughout the country. Formerly cattlemen as a rule owned their own bulls rather than as an exception as it is now. Improvement of the herd was difficult because there was no sure way of selecting an outstanding bull. If over a period of time a bull was found to yield outstanding offspring, others desiring to use him would have to deal with the owner and make arrangements for transportation of the bull or the cow to a common location. Obviously traveling long distances was impractical because the costs would soon outweigh the gain. Today, a cattleman need merely contact a breeding service and select the bull he wants.

The breeding service selects bulls according to recorded excellence of their family line and their offspring, or progeny. The progeny records for milk or meat production and other characteristics show in black and white which bulls can be expected to yield superior calves.

Modern techniques used in the collection, processing and preserving of the bull's semen assure that the cattleman will get all the potential of the bull even though he may be hundreds or thousands of miles from the bull stud.

Here are some figures showing the growth in popularity of artificial breeding in the United States.1/

YEAR	NO.FIRMS	DAIRY COWS BRED	NO.SIRES
1939	7	7,539	33
1948	91	1,713,581	1,745
1958	71	6,645,568	2,676
1968	32	7,138,636	2,028

Though the number of cows bred artificially has not increased significantly in the last decade, it must be remembered that the number of dairy cows on farms has decreased greatly, which results in a large percentage increase in the use of artificial breeding. About one-half of today's dairy cows are bred artificially. The percentage of beef cattle bred artificially is small but growing as mechanical difficulties are being overcome.

1/ Report of the Executive Secretary of the National Association of Animal Breeders at the 23rd Annual Convention held at Utah State University, Logan, Utah, August, 1970.

It should be noted that there is some artificial breeding of horses and hogs. This is relatively minor yet as the techniques of preserving the semen haven't been perfected to the extent that they have for cattle.

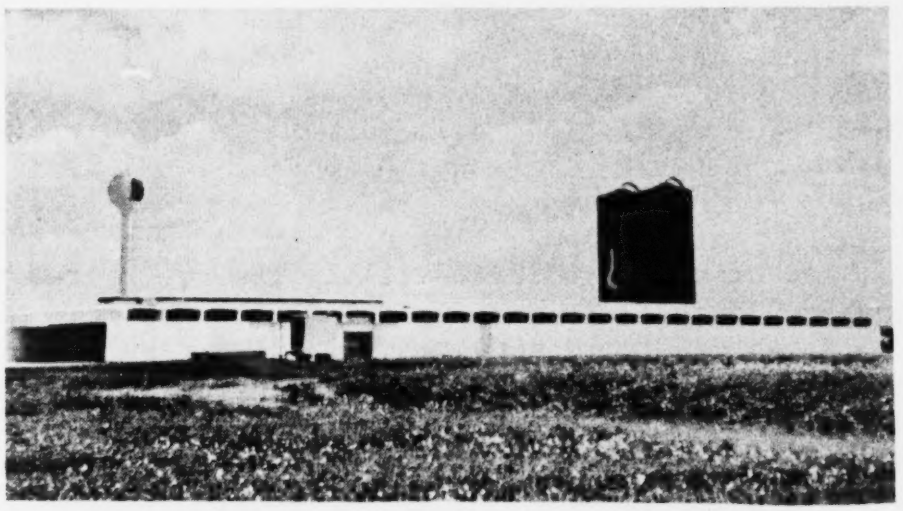
ORGANIZATION A typical artificial breeding establishment consists of administrative offices, several barns, a lab and a storage and shipping area. The administrative and clerical duties are the same as those of any typical business so there is no need to elaborate on them.

A typical establishment has several barns for up to 20 or more breeds of beef and dairy cattle. Each barn is staffed by a HERDSMAN who supervises the activities. He has one or more ASSISTANT HERDSMEN depending on the size of the barn. They are aided by LABORERS, who may be subclassified as LABORERS I and LABORERS II, who tend the bulls and clean the facilities. The HERDSMAN or an ASSISTANT HERDSMAN collects the semen.

The lab is staffed by a LAB MANAGER and a number of LAB TECHNICIANS depending on the size of the operation. The lab is where the semen is processed and frozen.

The storage area is staffed by a SHIPPING CLERK and his ASSISTANTS who keep an inventory of the semen stock and who fill orders and route them to the FIELD TECHNICIANS.

The FIELD TECHNICIAN (or BREEDING TECHNICIAN) usually is not employed by the breeding service but works under a contract with it. The service provides the necessary supplies as well as advertising and technical assistance and the TECHNICIAN in turn promotes the product and services of the breeding service.



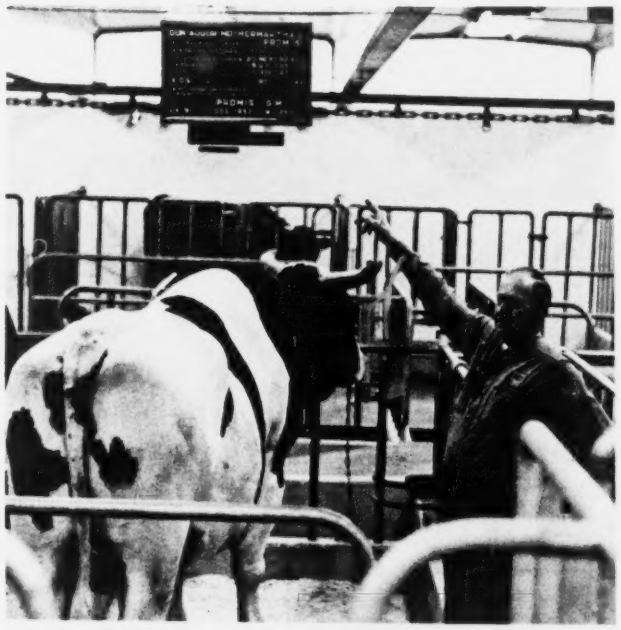
A fully air-conditioned dairy-bull barn.

OUTLOOK Artificial breeding is becoming increasingly popular and the trend is expected to continue. New techniques and a wider range of services will increase its advantages and decrease its disadvantages. This will be especially true for beef cattle. Better processing and freezing techniques will make better semen available, increasing improvement of progeny-tested bulls will make individual ownership more impractical, and the advantages of artificial breeding will become more widely accepted.

Crossbreeding is becoming more popular. The pure breeds are giving way to animals of mixed breeding which exhibit increased vigor, growth and size. Exotic breeds are popular for this purpose. These are the new European breeds such as the Simmental and the Limousin.

Some see the phasing out of the FIELD TECHNICIAN job. This is due to the increasing popularity of the "self breeding" programs. Cattlemen favor learning the techniques of insemination and doing it themselves to save the cost of the Technician's labor. If this happens, the TECHNICIAN will probably become a sales representative for the breeding service and a liaison man between it and the cattleman.

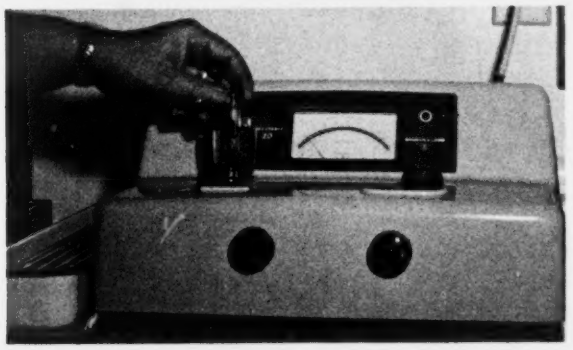
A breeding service representative evaluating a herd of crossbred cattle on a customer's ranch.



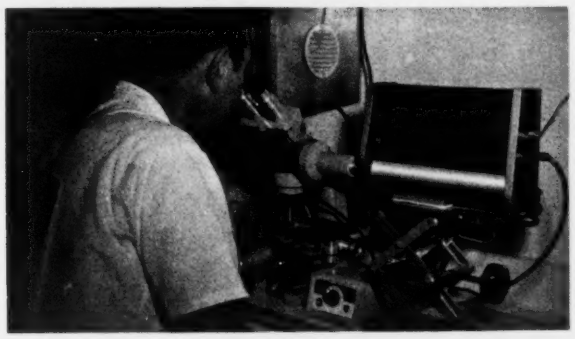
Pointing out a bull's evaluation.

JOBS AND PROCESSES The HERDSMAN schedules the bulls for semen collection. He evaluates the supply and consumption rate records and the bull's condition. The more popular and vigorous bulls are collected from twice weekly, usually Monday and Thursday, or Tuesday and Friday. The less popular and older bulls are collected from once weekly, often Wednesday. The collections are made starting early in the morning to avoid seasonally warm afternoon temperatures and to enable all of the semen to be processed and frozen the same working day.

Collection (above) in an artificial vagina (below).



Inserting tube into electronic measuring instrument.



Viewing sperm under microscope.

Two LABORERS lead the bull to the collecting area where the semen is to be collected. The bull is tied or held near another bull or a steer which serves as a "tease" animal. After the bull is excited sufficiently he is coaxed to mount the "tease" animal and the HERDSMAN or his ASSISTANT makes the collection using an artificial vagina.

An artificial vagina, basically, is a hard rubber tube with a hot water-filled liner that simulates a cow's vagina. It has a small, insulated, glass collecting tube on the end to catch the semen.

Once the semen is collected it is kept insulated to protect the sperm cells from being shocked by a drop in temperature. It is also labeled and an identifying number follows it through the whole process to insure proper identity. It is conveyed to the lab by any number of means. Here a LAB TECHNICIAN records the identity of the bull and pours the semen into a small amount of buffer solution.

Two samples are taken from the collecting tube by the TECHNICIAN. He places the first sample in a tube in an electronic testing device that measures the density of the semen by measuring the amount of light that passes through it. The density reading is then converted to the number of sperm cells per unit of volume. The LAB MANAGER places the second sample on a slide, views it under a microscope and estimates the percentage of motile sperm cells. With these figures he can determine the amount of diluent to add to the semen and in turn the number of ampules or pipets to be prepared for filling.

The diluent, which is composed of egg yolk or milk, glycerol and antibiotics, is added to the semen slowly and mixed gently. It is placed in a cold room to cool it gradually to prevent damage to the sperm cells.

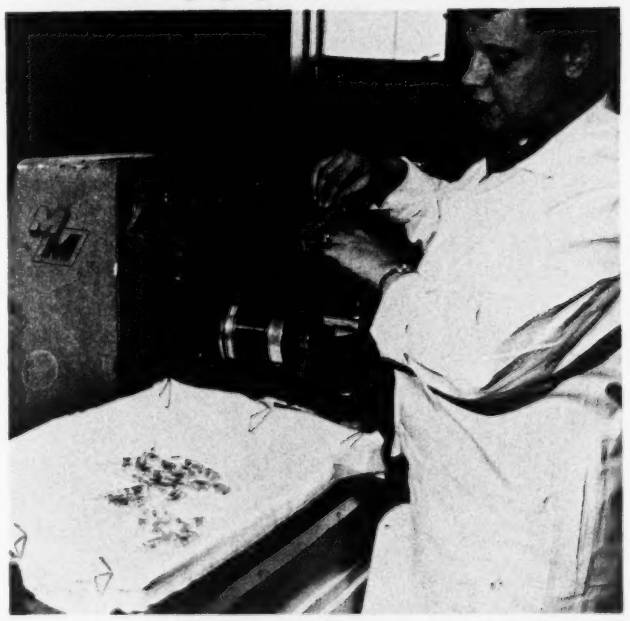
After the semen is cooled to 40°F., it is ready for packaging. Ampules are the most popular type of package. They are small glass vessels about 1-1/2 inches high and 1/2 inch in diameter. The neck is open for filling but is sealed by a flame immediately after filling. Pipets are popular in some areas. They are plastic straws about 18 inches long and 1/4 inch in diameter. The semen is drawn into and held in them by vacuum pressure.

The LAB TECHNICIANS are responsible for preparing the ampules or pipets. This involves labeling them using a simple machine that prints an identifying number on the ampules or pipets that corresponds with the identifying number of the bull whose semen will be put in them. They are then baked in an oven for sterilizing and to dry the ink. After filling, the ampules are put on canes which are light metal holders for six ampules. These canes also must be labeled with the identifying number of the bull. A LAB TECHNICIAN places a little sticker imprinted with the number on the top of each cane.

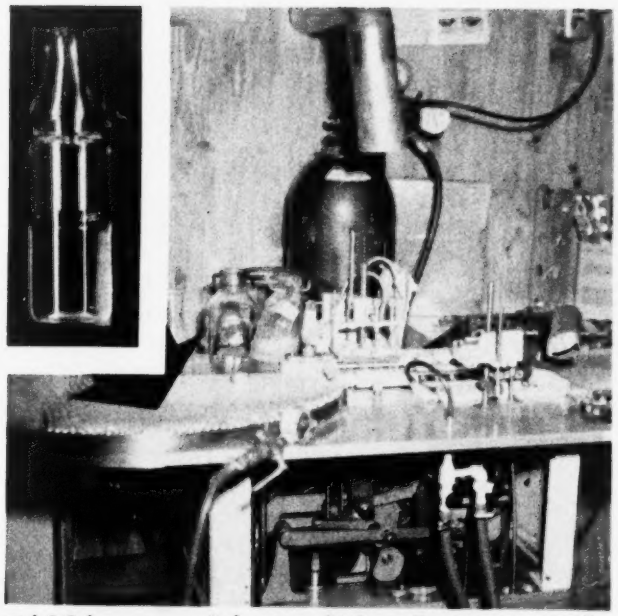
After the ampules or pipets are prepared and the semen cooled, they meet at the filling machine in the cold room. The LAB MANAGER or an experienced Technician operates the ampulating machine or the pipet filling machine. The operator is responsible for starting and

Preparing egg yolks for diluent.

Measuring glycerol for diluent.

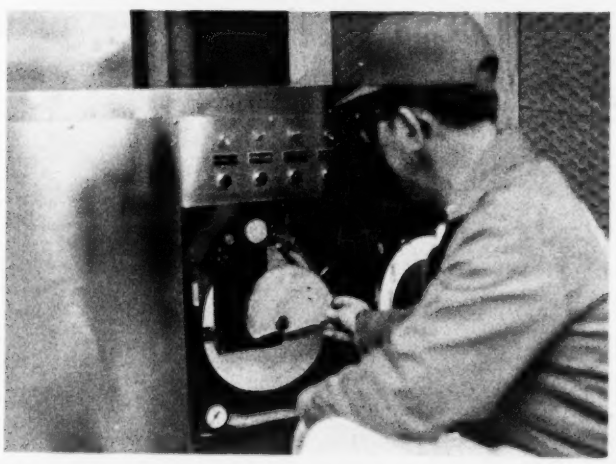


Labeling ampules prior to filling.



Filling machine with close-up of filled, sealed ampule (insert).

Snapping ampules onto canes.



Setting freezing machine controls.

adjusting the machine and observing it as it conveys the ampules past a nozzle that injects measured amounts of semen into the ampules, past a gas flame that melts the necks and hermetically seals them, and to the position where a TECHNICIAN places them on canes. The filling of pipets is similar to the filling of ampules. The canes of ampules and the pipets are then placed in metal racks prior to freezing.

The freezing process utilizes liquid nitrogen to reduce the temperature of the semen to -320°F. The racks of ampules or pipets are placed in an insulated chest into which the liquid nitrogen is pumped. The LAB MANAGER controls the rate of flow and observes the temperature on a gauge. He allows the liquid nitrogen to flow slowly at first until the semen freezes (at about -80°F.) and then rapidly to reduce the temperature to -320°F. in as short a time as possible.

After freezing the racks of ampules or pipets are placed in insulated boxes and carried to the storage area where the SHIPPING CLERK places the canes or pipets in the appropriate freezer for storage.

After the semen has been in storage for a period, usually 30 days, a sample of ampules is removed and returned to the lab. Here they are opened and the semen is analyzed for quality as determined by freedom from damage to the sperm cells.

This work may be done by the regular LAB TECHNICIANS. However, the larger establishments have a separate unit for quality control and research staffed by QUALITY CONTROL or RESEARCH TECHNICIANS. These TECHNICIANS then study the effects of processing and freezing on the sperm cells. They may also do research on

processing and freezing techniques to find ways to improve the quality of the final product; or basic research to learn more about the sperm cells themselves.

These TECHNICIANS may be supervised by the LAB MANAGER or by a separate QUALITY CONTROL SUPERVISOR depending on the size of the establishment.

After the semen has been in storage the required length of time, and has passed the quality control requirements, it is ready for routing to the FIELD TECHNICIANS by the SHIPPING CLERK.

Checking 40,000 ampule refrigerator.

FIELD TECHNICIAN

At regular intervals the FIELD TECHNICIANS place their orders for the semen and other supplies that they need. The SHIPPING CLERKS prepare these orders and route them to the FIELD TECHNICIAN via company truck or by common carrier. In a few cases it is possible for the FIELD TECHNICIAN to pick up his order because his territory is close to the breeding service's facilities.

Delivering Technicians' supplies.

Completing the farmer's records.

The FIELD TECHNICIAN receives requests for service from the dairymen (relatively few beef ranchers use artificial insemination in this area) the night before, or the morning of, the day the service is required. He plans his route to minimize overlap but yet to enable reaching all cows before their heat periods have elapsed.

Upon arriving at the farm he will insure proper identification of the cow for record purposes. He then selects the semen of the bull requested by the dairyman from his portable freezer, or he may be requested to make the selection himself on the basis of the character-

istics of the cow that need to be improved in the offspring. If the semen is in an ampule he puts it in a cup of ice water to thaw it; if in a pipet he holds it in the air to thaw it. While the semen is thawing he can make out the receipt and fill in the farmer's barn record.

Insemination of the cow is done with a syringe and a plastic tube. The head of the ampule is snapped off and the semen drawn into the tube with the syringe. A pipet serves as the delivery tube and needs only to have the syringe put on the open end and the sealed end snipped off. The FIELD TECHNICIAN guides the tube into the uterus with his hand feeling through the thin uterine wall from the rectum. By depressing the syringe he deposits the semen in the desired location.

During relatively slack periods the FIELD TECHNICIAN visits cattlemen in his area soliciting new business since his success depends on his own effort and sales ability. He also spends time working with cattlemen to help them improve their breeding programs. He may also set up and conduct, with the help of the breeding service, schools to teach the techniques of insemination to those cattlemen who wish to breed their cattle themselves. He then becomes a sales representative of the breeding service to these cattlemen.

Filling a farmer's refrigerator.

ENTRY LEVEL QUALIFICATIONS

These jobs can be divided into two categories. In one, the jobs relate directly to animals. These are the jobs in the barns; LABORER, ASSISTANT HERDSMAN, and HERDSMAN. In the second category are the jobs in the lab.

The main qualification for the first category of jobs is a liking for animals and an ability to handle them such as is gained from experience in working on a dairy farm. In addition to this, a high school education is generally required.

Beyond this, the HERDSMAN is required to have many years of experience in livestock and personnel management usually in addition to college work relating to livestock or genetics.

For jobs in the second category the ability to work accurately with precise equipment is the first requirement. A high school education is usually required with courses in biology or chemistry.

III. DAIRY COW TESTING

INTRODUCTION Dairy cow testing can be an important economic device for dairy farmers. This hasn't always been the case however. Prior to the time when Stephen Babcock developed the now famous butterfat tester it was difficult if not impossible to determine which cows were good fat producers and which were just good eaters. All of the farmers' milk was purchased for the same price regardless of butterfat content. After the development of the butterfat tester it was possible for cheese and butter factories to determine which dairyman's milk was higher in percentage of butterfat and which was lower. The former was paid a higher price than the latter. It therefore became important for the dairymen to know which cows were the poor fat producers so that they could be replaced with better producers for higher income. A regular schedule of testing was established for this purpose. Indicative of its importance, 3,028 Wisconsin dairymen registered 51,000 cows for testing in 1921. These cows averaged 7,000 pounds of milk and 265 pounds of fat which was a gain of 2,000 pounds of milk and 75 pounds of fat above the state average.1/ About 1929 the Dairy Herd Improvement Association replaced earlier butterfat testing organizations and has continued until now.

ORGANIZATION The operational structure of the Dairy Herd Improvement Associations is at a state and county level with a loose national organization. In Wisconsin for example, the University Extension Service oversees the operation. Three faculty members are Extension Dairymen, specialists in the field of dairy science. They act as technical advisors to the Extension Agents on the county level. In many cases the Extension Agent is the manager of the county co-op. He has on his staff FIELDMEN, LAB TECHNICIANS, and Bookkeepers. Its 15,000 members elect a board of directors which hires the General Manager. The General Manager directs the office staff and three Area Managers in the field.

OUTLOOK Dairying is becoming more complex and dairymen are going to need more and more information on which to base their decisions. Dairy herds are bigger, investments are larger, production is greater, and more money rests on every decision. Because of this, dairymen and other farmers as well, are learning the values of good record keeping systems. It is foreseen therefore, that more dairymen will join D.H.I.A. in the future.

Consolidation of smaller county units into larger multicounty units will continue as a matter of economy. These consolidated units will have the new electronic testing equipment. The Babcock method will continue elsewhere due to the expense of changing over equipment.

1/ Fifty years of Cooperative Extension in Wisconsin 1912 - 1962, University of Wisconsin Extension Service Circular 602, p. 91.

JOBS AND PROCESSES

When a dairyman joins D.H.I.A. he can choose one of two plans of milk sample taking. The first plan is called the Standard plan. In this plan a D.H.I.A. FIELDMAN visits the farm once a month at about the same day of every month. He is there for the evening milking and the following morning milking. He weighs the amount of feed given each cow, weighs its milk, and records the data on a record sheet. He also takes a sample of each cow's milk and puts it in a small glass bottle for testing.

Preparing milk sample bottles.

In the second plan, called the Owner-Sampler plan, the dairyman himself weighs the feed and milk and takes the milk samples. The FIELDMAN picks up the filled sample bottles that he had delivered the day before and takes them to the lab. The dairyman pays a smaller fee for this plan but he must expend more of his own time. Also, only the Standard plan results are accepted for official records by such organizations as breed associations.

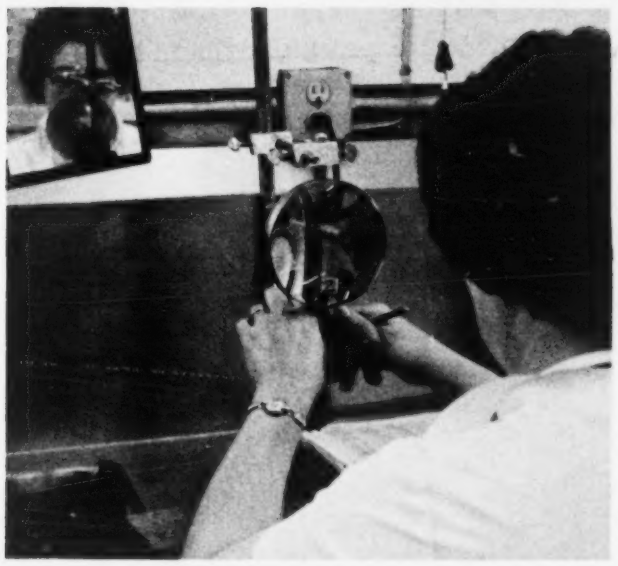
In either plan the milk is tested by either the Babcock method or the newer electronic method. The Babcock method of testing is based on the use of sulfuric acid which dissolves all of the contents of the milk except the fat which separates and rises to the surface. The LAB TECHNICIAN first mixes the bottles of milk samples to distribute the fat evenly. She then transfers the milk from the sample bottles to the test bottles. At all steps of the process the test bottles are handled in a designated sequence to maintain their identity. In the end the data will be recorded across from the corresponding cow's name or number. The next step is to add measured amounts of sulfuric acid to each of the test bottles. This may be done with a simple dipper or an automatic device.

Milk samples being shaken to mix fat particles before testing.

Dispensing milk into test bottles after drawing from sample bottles.

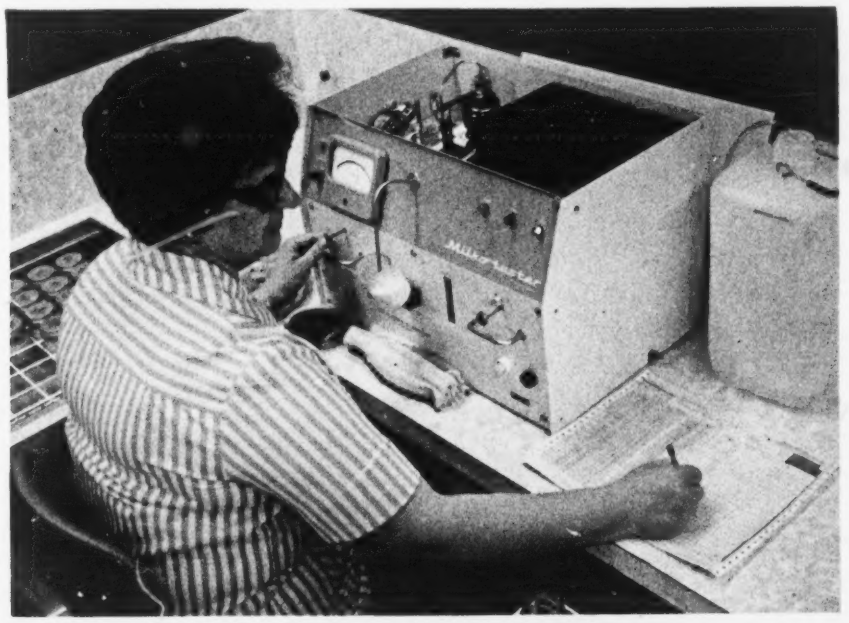
The test bottles are then placed on a shaker to mix the sulfuric acid with the milk. From there the test bottles are placed in a centrifuge which spins the test bottles thus separating the fat from the rest of the dissolved milk contents. The test bottles are then removed from the centrifuge and placed in a hot water bath to keep the contents at a temperature equal to the body temperature of the cow so that an accurate reading can be made. Hot water is then added to the bottles to raise the fat into the long, slender neck of the test bottle. The LAB TECHNICIAN can then measure the height of the column of fat by reading the calibrations on the neck of the bottle or by measuring it with a micrometer. This data is then recorded on the record sheet.

Adding sulfuric acid to sample.



Placing test bottles in centrifuge (above left). Adding hot water from dispenser after spinning in centrifuge (above). Reading height of column of fat in neck of test bottle looking through a magnifying lens and measuring with micrometer.

The electronic method of testing utilizes a photoelectric cell that measures the amount of light that passes through the milk. The higher the fat content the less light that will pass through it. The results are registered on a gauge that is calibrated in percentages of fat.



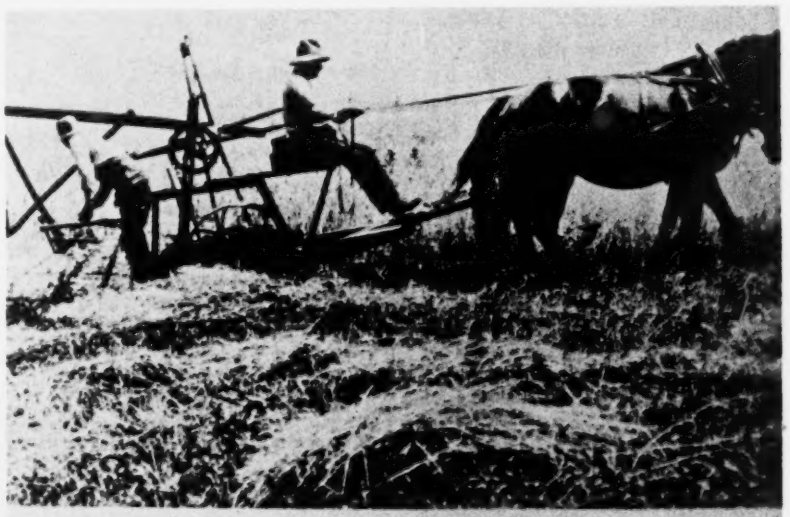
Lab Technician performing butterfat tests on samples of milk using an electronic testing machine.

The LAB TECHNICIAN places the sample bottle under an intake nozzle and presses a button activating the intake pump. The tester draws the milk in, homogenizes it to evenly distribute the fat throughout the sample, beams the light through the sample onto a photoelectric cell which measures the amount of light, and registers that amount on the gauge. The LAB TECHNICIAN reads the gauge and records the amount on the record sheet, pushes a button to discharge the tested milk from the tester, and repeats the process for all of the samples.

In an increasing number of cases, after all of the data is recorded in the lab it is sent to a data processing center where specially programed computers utilize the data to calculate a variety of information to be used by the dairyman in evaluating the performance of the cows in his herd.

IV. EQUIPMENT SALES AND SERVICE

INTRODUCTION The first farm implement was probably a stick used for a plow. Eventually wooden plows were developed. These were later improved by fastening an iron tip on them with strips of rawhide. In 1797 a patent was granted for the first cast iron plow, beginning the use of metals in farm implements. Another significant step in farm mechanization was the invention of the two-horse reaper which allowed vast quantities of wheat to be handled by only two men. Numerous other machines were invented and improved upon; 917 in 1860 alone.



McCormick reaping and mowing machine of 1857 at work in the field.

The invention of these machines for agriculture caused a need for a source of power to operate them; thus began the development of the tractor. The first mechanical farm power took the form of portable steam engines. In the mid-1800's these were improved to self-propelled traction engines, primarily used for plowing. Development of the gasoline engine tractor was spurred by the need to reduce the size of the threshing crews which often included a dozen men.

The development of the gasoline tractor was speeded by the discovery of petroleum fuel. The first successful gasoline tractor was built in 1892 by John Froelich. Tractors were needed to do more than plow however. In 1924 the first really successful all-purpose tractor was produced. Further developments included pneumatic tires, hydraulic power systems, hydrostatic transmissions, and air-conditioned cabs among others for added efficiency, safety and convenience.

ORGANIZATION The local farm implement dealer sells and services a full line of tractors and other machinery for which there is a demand in his community. These will include the products of several manufacturers. A typical dealership will have a General Manager, a MANAGER of each department as Sales, Service, and Office, and staff in each of these, SALESMEN, MECHANICS, and clerical staff.

OUTLOOK Changes in farm equipment have been dramatic in the last ten years. In the next ten years the changes will be even more dramatic. This will increase the demand for servicemen with vocational school training. Those men on the job now will require retraining to keep up with the changes.

Lease arrangements will continue to be popular because they allow the farmer to keep his capital liquid and allow the dealer to sell at a reduced price an expensive piece of equipment that he could not otherwise sell because he can earn revenue for its use to offset the depreciation incurred.

JOBS AND PROCESSES The jobs in a farm equipment dealership are not very different from certain other retail trade jobs; they are very similar to the jobs in an automobile dealership. As in an automobile dealership, space does not allow stocking of each and every make and model of equipment. The SALESMAN therefore relies on manufacturers' catalogs to assist the farmer in his selection of a piece of equipment. He then closes the deal after the choice is made and arranges for financing.

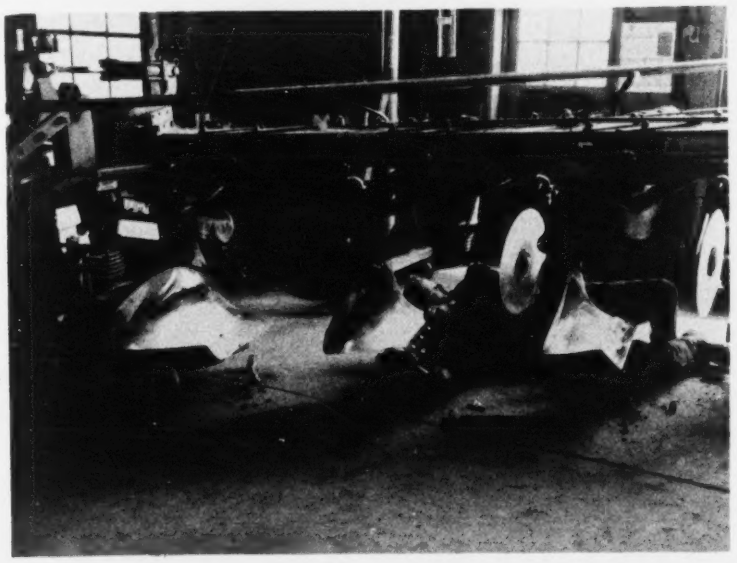
Salesman showing a tractor.

The farmer may be interested in buying a used piece of equipment. If this is the case the SALESMAN will show him the equipment on hand and help him make his selection. Some of these pieces were trade-ins on newer equipment. Many of them were leased to farmers or canning companies for a period of time.

If the farmer is interested in leasing a piece of equipment it may be because he is short of capital. Even if it would cost more in the long run, it enables him to use his funds for other necessities and still have the use of the equipment. If he needs it for only a short period, as for plowing, he may want to rent the equipment. In either case the SALESMAN will finalize the agreement and make the necessary arrangements.

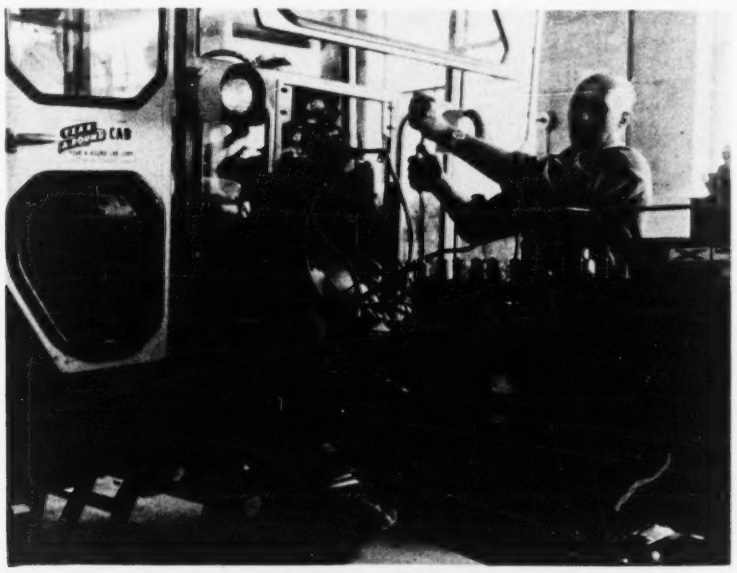
Set-up Man making adjustments on a piece of spraying equipment.

Service is an important part of the dealer's business. A customer won't be satisfied unless he receives good service after the purchase no matter how good a deal he got. A large service department will have the following positions: SET-UP MAN, NONMOTORIZED EQUIPMENT REPAIRMAN, MOTORIZED EQUIPMENT MECHANIC, and TRACTOR MECHANIC. These jobs will be supported by the PARTSMAN, TRUCK DRIVER, and TIRE AND PAINT MAN. The number of persons in each of these jobs will vary from dealer to dealer. In fact, in small dealerships there may be only a couple of men who do all of the jobs.



Nonmotorized Equipment Repairmen working on a six-bottom plow.

The SET-UP MEN receive implements from the factory that are shipped in component parts. They assemble them using hand and power tools following the illustrated instructions. The NONMOTORIZED EQUIPMENT REPAIRMEN, as the name indicates, repair farm equipment that does not have a motor, such as plows, planters, and cultivators. They use hand and power tools to repair or replace defective parts.



Tractor Mechanic working on an engine.

MOTORIZED EQUIPMENT MECHANICS and TRACTOR MECHANICS have very similar jobs. In many establishments, in fact, there may be just one job comprising both areas. Their job is to diagnose the malfunctions of the engines of tractors and other motorized equipment such as combines, determine the likely causes, and repair or replace the defective parts to restore performance.

PARTSMEN work in the parts department supplying the repairmen and mechanics with needed parts and maintaining the inventory of parts and accessories. The TRUCK DRIVERS pick up disabled equipment from the farms with large trucks and haul it to the shop for repair. The TIRE AND PAINT MAN paints any equipment that needs renovation, and repairs and mounts tractor and implement tires.

A Partsman locating a part in inventory after writing up the customer's order.

ENTRY LEVEL QUALIFICATIONS

The principal qualification for these jobs is a liking for and an ability to work with the equipment. Motor mechanics is an area in which natural ability is important. Employers look for a demonstration of this ability in one of two situations; achievement in high school shop and agriculture courses, and in work experience at less complex jobs such as equipment set-up and nonmotorized equipment repair. Vocational school trained mechanics are always in demand.

SALESMEN often start out as mechanics, or at least have some sort of work experience with farm equipment on which to base an understanding of the design and function of the various kinds and types of equipment.

SET-UP MEN usually need only a desire to work with equipment and demonstrate the ability to do so. Most receive on-the-job training and work their way up to other jobs.

NONMOTORIZED EQUIPMENT REPAIRMEN usually work up to this position after demonstrating their mechanical ability as SET-UP MEN. Additional on-the-job training enables them to do this.

There are no special requirements for the other jobs other than the desire to work and the demonstration of that willingness.

V. EXTENSION EDUCATION

INTRODUCTION Extension education got its start with the passage of three laws in 1862. These were the Homestead Act, the Morrill Land-Grant College Act, and the establishment of the United States Department of Agriculture (U.S.D.A.). The Morrill Act gave 30,000 acres to each state for each congressional representative. The proceeds from the sale of these lands were to be used for the establishment of colleges of agriculture and mechanic arts. These colleges were soon to become the centers of agricultural research and learning.

In 1887 Congress passed the Hatch Act which provided for the dissemination of experimental findings to farmers. This began off-campus, on-the-farm education.

In 1914 Congress passed the Smith-Lever Act which is the Federal Agricultural Extension act. This act provides for cooperation between the U.S.D.A. and the land-grant colleges. It linked federal, state and local forces and gave extension greater strength and vitality.

An extension agent of an earlier day.

The first extension agents traveled about the countryside in livery sleighs or in old Model A Fords loaded down with soil augers, butterfat testers, brochures on a wide variety of subjects, and dozens of other instructional aids. Today's agent travels in a modern automobile and carries movies, slides, projectors and other audio-visual aids and the ever-present brochure.

General agriculture was the first field covered by the extension agents; thus the name AGRICULTURAL AGENT. Soon to be added to the scene were the HOME ECONOMICS and FOUR-H CLUB AGENTS who work with the homemakers and youth respectively.

ORGANIZATION Today the extension staff consists of a core that includes the AGRICULTURAL (or ACRI-BUSINESS in urban areas), HOME ECONOMICS and FOUR-H and YOUTH AGENTS. These are complemented by any of the following depending on the needs of the county: LIVESTOCK, FARM MANAGEMENT, HORTICULTURE, RESOURCE, RECREATION, CONTINUING EDUCATION, FORESTRY, ENVIRONMENTAL QUALITY or other Special Agents.

OUTLOOK Extension education has a place in the future. Agriculture is becoming more complex and sophisticated and so those engaged in agriculture will need reliable sources of technical assistance. Extension specialists will provide such a source. These agents will probably have to specialize to a greater degree than they do today and depend to a greater extent on university experts to maintain competence in their respective areas.

The trend has begun and will continue toward greater involvement in community affairs and urban problems. Environmental quality and the development of recreational or industrial resources are examples of areas of involvement by Special Agents in community affairs, and those who work with minority group businessmen are examples of those involved in urban problems. These and other similar problems will receive greater emphasis in the near future.

Along this same line, the image of Four-H will continue to change. Four-H is not a program solely of raising livestock for showing at county fairs. It is a balanced program for the personal development of the members. The showing of animals at fairs is only one tool to achieve this goal. This will become more widely realized as Four-H becomes more involved in urban-oriented projects.

JOBS AND PROCESSES The specific duties of any one job vary from county to county depending on the conditions and the needs that exist. For example, an AGRICULTURAL AGENT in a county where many cattle are raised has duties of a somewhat different nature than an AGRICULTURAL AGENT in a county where many sheep are raised. The basic functions of information giving and instruction are the same, however. The following descriptions then include only the general duties. In each case the primary duty is to prepare and conduct educational programs for the residents of the county. These programs can take a variety of forms such as seminars, workshops, lectures and discussions, academic classes, or demonstrations in the home or on the farm.

The AGRICULTURAL AGENT is a specialist in the major areas of general agriculture, including crops, soils, livestock management, and farm management. In counties where larger staffs permit, he specializes in the areas of crops and soils, and other staff in the other areas.

Besides his functions as an agricultural specialist, he is also an administrator since he is the chairman of the staff. This involves supervising the rest of the staff, coordinating activities, reviewing the budget and acting as liaison with the county agriculture committee. Since this is an administrative position it is filled from among the ranks of experienced personnel.

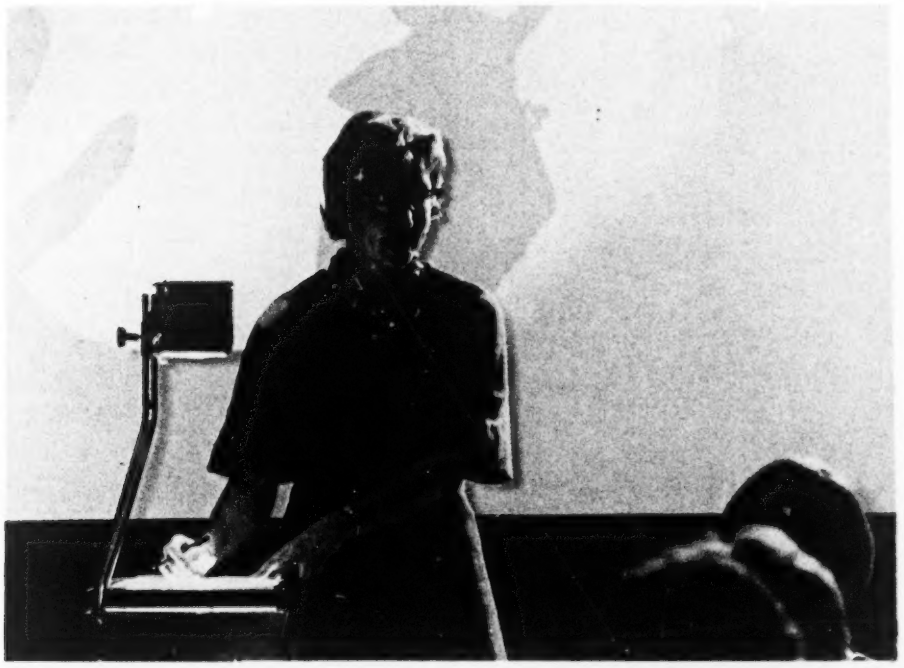
An Agricultural Agent discussing a problem with a farmer.

The AGRI-BUSINESS AGENT has a position similar to the AGRICULTURAL AGENT. He is substituted for the Agricultural Agent in counties where the business sector constitutes a problem area to be assisted by educational programs. This is often true in counties that have relatively large metropolitan areas. Besides working with farmers in the area of general agriculture, he also works with small businessmen in the areas of commerce, marketing, personnel management and the like. His position too is administrative with duties as described for the AGRICULTURAL AGENT.

The HOME ECONOMICS AGENT works with the homemakers in the county presenting educational programs on such subjects as nutrition, clothing, child care, and family finances. She usually works through homemaker clubs which are groups of homemakers who meet regularly to discuss a chosen topic. Prior to the club meeting, each club sends a representative to meet with the Agent who herself presents material on the chosen topic or arranges for a university specialist to do so. The club representatives then return to their respective clubs and relay the information to the other members.

An Agent interviewing a mother.

The FOUR-H CLUB AGENT and the YOUTH AGENT work with the boys and girls and the young adults in the county. Some counties have only a FOUR-H AGENT, others have both; the FOUR-H AGENT working primarily with the boys and the YOUTH AGENT with the girls. Their job has two main functions.



A Four-H Agent illustrating her presentation.

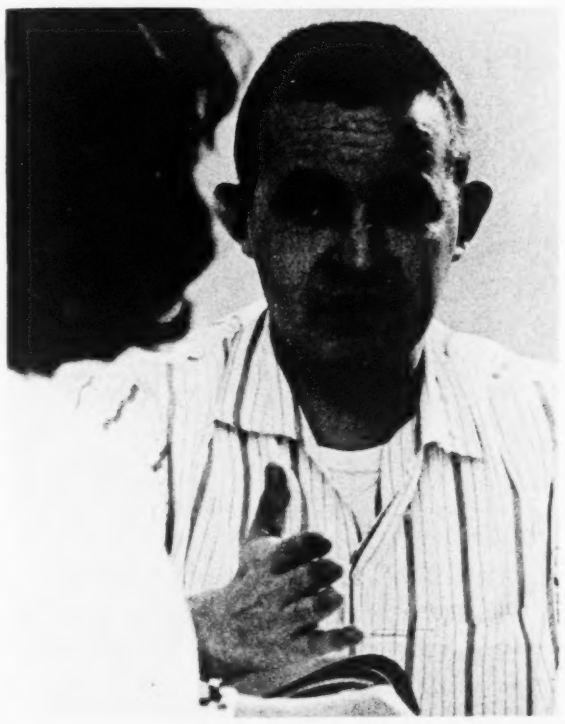
First, they administer and coordinate the countywide projects and activities such as membership drives, camps, and fairs. The second function is to train adult volunteer leaders in project areas such as manual arts, animal husbandry, horticulture, or areas of home economics, so the adult leaders can in turn instruct their club members. The overall aim is to assist the personal development of the members using such tools as projects, camp sessions, and fairs.

The FARM MANAGEMENT AGENT is a specialist in the area of agricultural economics. He conducts educational programs for farmers that involve matters concerning the "business" of farming. He covers such subjects as record keeping, efficient livestock feeding systems, alternatives of buying or renting various resources, projected crop prices, and taxes. Because every farmer has individual problems, much of his time is spent on individual follow-up on-the-farm.

A Livestock Agent giving advice to two young future farmers.

The RESOURCE AGENT works as an advisor to people in the county who are interested in the development of economic resources. This includes presenting technical information to planners and administrators, acting as a liaison between the county and federal agencies, and the informing of county residents on county issues. Examples of projects that he may be involved in include the planning of parks, the development of skiing or boating facilities, the promotion of tourism, or the attraction of industry to the county.

Other agents include the LIVESTOCK AGENT, who conducts educational programs on the management of livestock including breeding, feeding, marketing and other facets; the HORTICULTURAL AGENT, who is often found in urban areas where he advises homeowners on the development and care of gardens and lawns, or in fruit-growing areas where he advises fruit growers on the care of fruit trees; the FORESTRY AGENT, who is located in counties with large forests to assist in the conservation of forests and wildlife, and the development of resources; the RECREATION AGENT, who works with community planners in the development of recreational facilities and programs for county residents; the CONTINUING EDUCATION AGENT, who conducts academic classes in credit and noncredit university courses for the enrichment of county residents; and the ENVIRONMENTAL QUALITY AGENT, who works through civic groups to inform the public of the dangers of pollution and means of prevention and abatement. In addition to these there may be others that fill particular needs in particular areas.



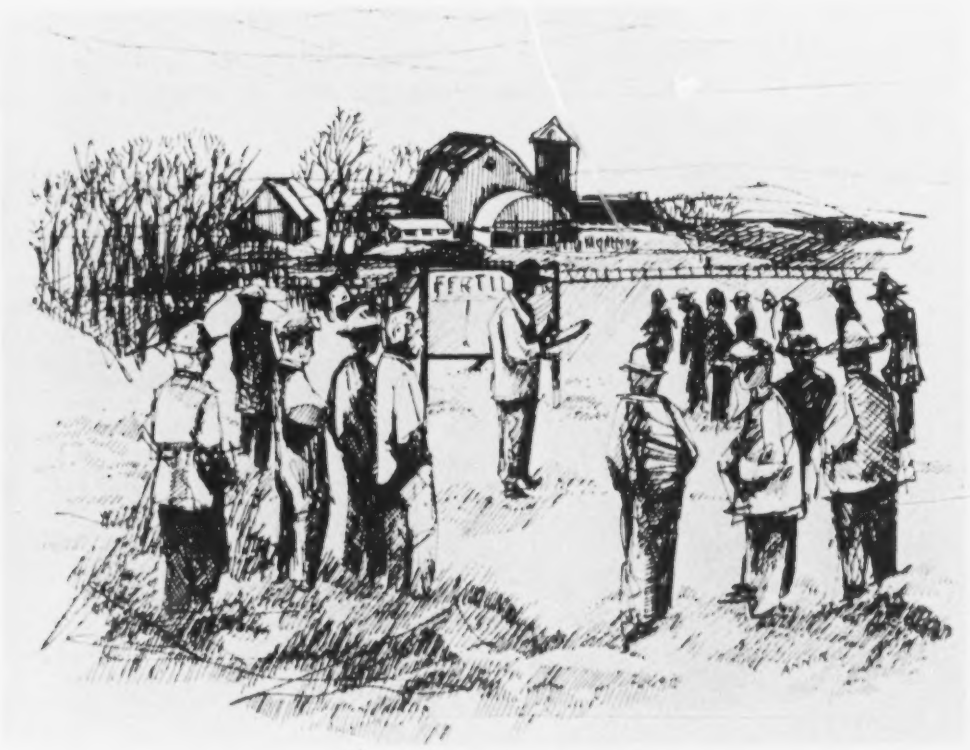
All Agents must relate well with the people they meet.

ENTRY LEVEL QUALIFICATIONS

A person who wishes to be an Extension Agent must first be able to relate well with people. The job is one of conveying information to people and therefore requires the ability to communicate effectively. In many cases a rural background is a necessity in order to understand the problems and attitudes of farmers, farm families, and nonfarm rural residents.

In addition to this, a Master's Degree in the field of specialization is required. Some Agents are hired with the understanding they will complete the work for the Master's Degree within a period of time.

Though not a strict requirement, some experience in teaching in agriculture or a related area is preferred. This serves as evidence of being able to communicate with people and serves as an indication of the level of professional competence.



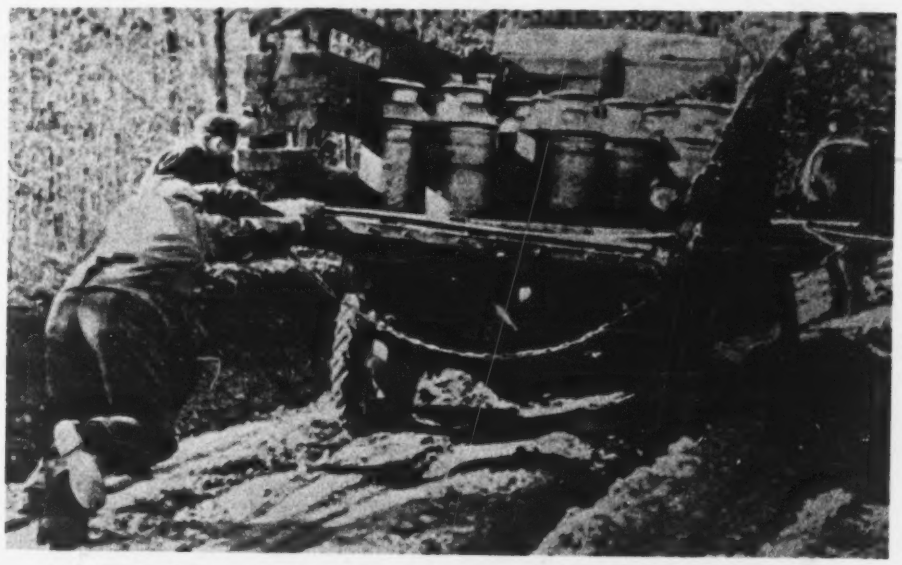
VI. MARKETING SERVICES

INTRODUCTION The marketing of agricultural products has taken place ever since man learned how to produce more than his own family could readily use. The first cities were made possible by the fact that agricultural production was sufficient to support non-agriculturally productive people. Initially, these people were a priestly class and they were given food products as tribute.

Later, as the division of labor evolved, products of one man's labor were traded for those of another, including agricultural products. Trading was on a person-to-person basis. The advent of money simplified the transactions but they were still on a person-to-person basis until recent times.

With the development of the mass production of agricultural products, advances in modern storage and transportation methods, and the growth of distant urban markets, the marketing of agricultural products has become very impersonal. The farmer producer no longer hauls his products to town on market day for sale to the local townspeople. It is for this reason that complex marketing organizations have been developed.

OUTLOOK As long as there are products produced there will be products that will need marketing. Milk marketing will continue to see larger organizations formed from smaller ones and larger milk hauling vehicles. Livestock marketing will be controlled more by the producer to control costs and raise returns.

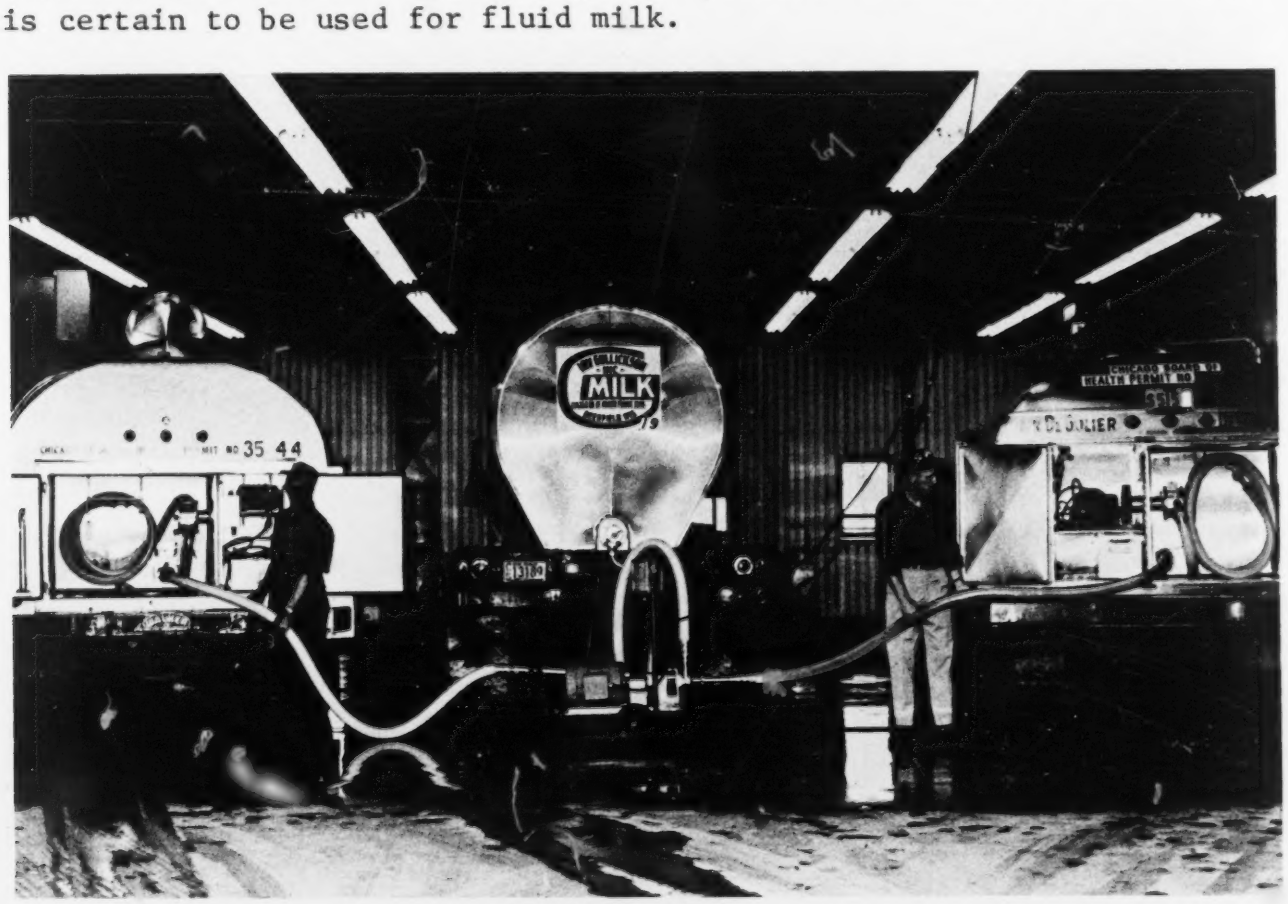


Milk marketing in an earlier day.

MILK MARKETING

Milk presents a particular problem in marketing because of its perishability. A number of cooperatives have worked out similar transportation networks to assure prompt and efficient use of their members' milk. Typically, a MILK HAULER will pick up the milk from a farm every day or every other day depending on the amount. It is hauled to a plant where it is pumped into storage tanks. From the storage tanks as much as is needed for the fluid market is pumped into semi-tank trucks for shipment to the fluid market where it is bottled and distributed. The balance of the milk is used at the plant to manufacture butter, cheese, or dry milk products.

An alternative to the system is that the MILK HAULER may haul the milk from the farm to a pump-over station where the milk is pumped directly into a semi-tanker for immediate shipment to the fluid market. These stations handle only that portion of a firm's milk which is certain to be used for fluid milk.



Two Milk Haulers pumping-over their milk to a semi-trailer.

Ordinarily the MILK HAULER is not an employee of the milk marketing cooperative but rather is an independent contractor who hauls milk for the dairyman to the co-op of the dairyman's choice. He may therefore haul milk to more than one co-op.

Inspecting the milk.

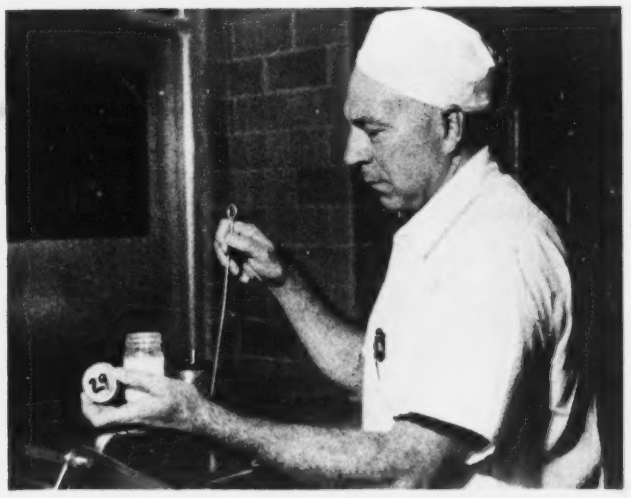
Reading the calibrated rod to measure amount of milk.

JOBS AND PROCESSES

When the MILK HAULER gets to the farm milkhouse the first thing he does is inspect the milk for any off-color or odor that would indicate contamination of the milk. Then he reads the temperature on the thermometer to assure that the milk is sufficiently cooled. He then measures the amount of milk using a calibrated measuring rod and records the amount and the temperature on his and the dairyman's records. He then starts the agitator in the bulk tank to uniformly distribute the fat throughout the milk. This takes from five to ten minutes. After agitating, the milk is ready to be sampled. The MILK HAULER takes the sample using a sterile scoop and pours the milk into a small bottle or plastic bag which is placed in a refrigerated compartment in the truck for transport to the lab. The MILK HAULER is then ready to hook up the hose from his truck to the bulk tank to pump the milk into the truck. After making all of his stops he drives to the plant or pump-over station where the milk is transferred to a storage tank or semi-tank truck and the milk samples are given to the testing personnel. At the lab the milk is analyzed for butterfat and bacteria content which enables the dairyman to be paid for his milk according to fat content and also enables tracing of any contamination that may occur to the load of milk.

The MILK HAULER and the dairyman receive technical assistance from the FIELDMAN who is an expert in milk production. He is called upon when problems arise. Often a problem is discovered by the MILK HAULER when he comes to pick up the milk and upon inspection discovers an off-odor or color. The FIELDMAN assists in locating and eliminating the problem. An analysis of the milk often yields information on the type of contamination present and thus suggests possible sources.

Starting the milk agitator.



Taking a sample of milk.

In another instance a dairyman may have a problem in feeding or some other milk production related area. The FIELDMAN upon request will advise him of feeding requirements or other measures to follow to relieve the situation. This not only serves the dairyman but also the co-op because it is assured of a constant supply of quality milk.

Another service offered by the co-op is the calibration of bulk milk tanks. This is important because the dairyman is paid by weight for his milk and the weight corresponds to the depth of the milk in the tank as measured by a calibrated rod. The calibrated rod is usually positioned on the end or side of the tank so as to not interfere with the agitator. However, this also makes accurate measurement more difficult. If the tank is not perfectly level the milk will reach higher or lower on the rod than it should. If the tank slopes toward the rod the co-op loses money by paying for more than it receives and if the tank slopes away from the rod the dairyman loses money.

Connecting the hose carefully prior to pumping into the truck.

Storing the milk sample for delivery to the testing lab.

If the dairyman requests it, a FIELDMAN conducts a test of the calibration of his bulk tank. This is done in the following way. First, the tank is emptied and cleaned. Then, using special buckets of known capacity the FIELDMAN puts a known amount of water into the tank and reads the scale on the calibrated rod to see if the amounts correspond. If the rod reads a greater amount he raises that end or side of the tank; if less he lowers that end or side of the tank until the correct reading is achieved.

ENTRY LEVEL QUALIFICATIONS

The first qualification for being a MILK HAULER is a general working knowledge of milk and its properties. The ability to drive a truck is secondary to the ability to detect impure milk to avoid contamination of an entire load and to be able to advise the dairymen on preventive measures. A high school education is generally required and in addition a license to sample and inspect milk. The license is obtained by passing a test administered by the state.

The number of milk routes is relatively fixed. The areas covered by each are administered by a government agency which issues permits to serve specific areas. Special permission must be obtained to serve a farm outside a permitted area. Therefore a person desiring to go to work as a MILK HAULER must either work for a firm with a number of routes where there is an opening or he must buy out an existing route from another Hauler.

The primary requirement for a FIELDMAN is expertise in the area of milk production such as is gained through years of experience in the field. This experience may be in dairy farming itself, as an EXTENSION AGENT, MILK HAULER or other related occupation. On-the-job training then supplements the experience and continuing training through meetings and workshops maintains the level of expertise.

LIVESTOCK MARKETING

Livestock can be marketed in one of two ways; by public auction, or by private treaty contract. In an auction the animals are presented individually or in groups before the buyers. The buyer who makes the highest bid gets the livestock. The seller receives the price offered minus a service charge for the use of the facilities. In a private treaty agreement the buyer offers a certain price for specific kinds, weights, and grades of livestock and any seller can sell his livestock for the offered price.

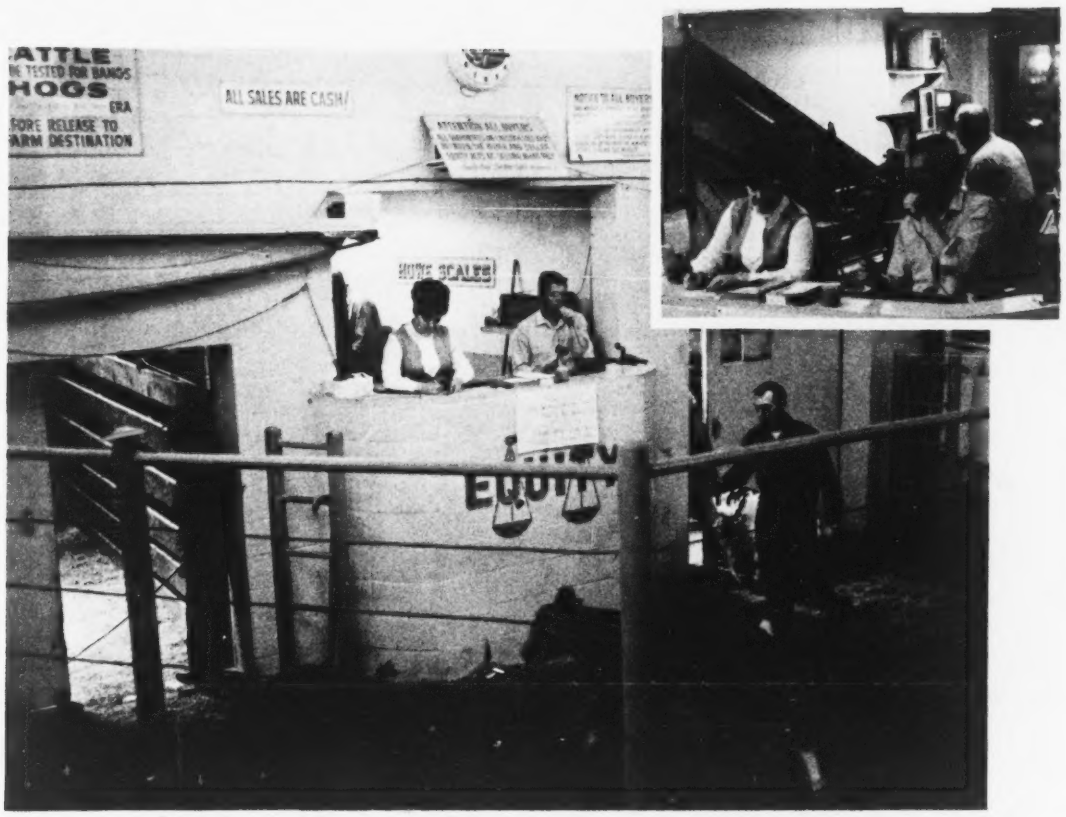
There are a number of livestock marketing cooperatives that have been established to provide a place for the members to bring their livestock for sale in a more informed and strengthened position than they would have as individuals. The co-ops operate auction markets where there are facilities for conducting business transactions. These transactions include the recording of auction sales, payment and receipt of money, and also the arrangement and conclusion of private treaty agreements.

JOBS AND PROCESSES

The members of the cooperative elect a board of directors which hires the MANAGER of the marketing operations. The MANAGER hires his staff and is in charge of scheduling regular and special sales and advertising to attract a large number of buyers to these sales. His staff consists of office girls to handle the book work and LIVESTOCK HANDLERS to tend the animals. In some cases the MANAGER is the AUCTIONEER; in others this is a separate job.

The farmer hauls his livestock to the auction market on auction day and after the animals are unloaded he is given a receipt. Each animal is given an identifying number which is also on the farmer's receipt. The animals are then sorted by size or grade and herded into pens by the LIVESTOCK HANDLERS until their time of sale in the auction ring. At the time of the auction the animals are herded into the ring either individually or in lots for inspection by the buyers.

Unloading hogs for sale at auction.



The Auctioneer (above) conducts the bidding while the Auction Clerk records the sales and the Ringman herds the calf to the scale on the left. Note the insert showing the Auctioneer, Clerk and the Weighmaster.

The Weighmaster balances the scale and prints the weight.

The AUCTIONEER starts the bidding and accepts bids from the buyers until the highest price is reached. During the bidding two RINGMEN maneuver the animal to show all angles to the buyers so they can better judge the value and thus the amount they're willing to pay. When the AUCTIONEER accepts the last bid he tells the AUCTION CLERK the identification number of the buyer, the price bid, and the identification number of the animal. The AUCTION CLERK records the information on the sales ticket and passes the ticket to the WEIGHMASTER.

At the same time the RINGMEN herd the animal out of the show ring and onto the scale where it is weighed by the WEIGHMASTER. The scale is like a pen with the floor being the scale itself. The WEIGHMASTER makes the weight reading when the animal is still by pressing a lever which prints the weight on the sales ticket.

This must be done precisely and rapidly because it is possible for the AUCTIONEER to sell three individual animals in a minute. When animals are sold in lots the entire lot is weighed at the same time.

After weighing, the animal is herded by the LIVESTOCK HANDLERS to the pen designated for the particular buyer. While the animals are being penned the sales ticket goes to the office where records are made of the transaction. After the sale is completed the buyers make their payments for their livestock and the farmers are paid accordingly.

The clerical staff records the sales information in the office.

ENTRY LEVEL QUALIFICATIONS

The MANAGER'S and AUCTIONEER'S jobs are the only permanent positions (they may in fact be one job). The livestock handling and clerical jobs are generally part-time because the auction markets are usually open only a couple of days each week. These part-time positions are often filled therefore by farmers and farmers' wives in the winter months and students in the summer months.

The clerical help needs to be able to learn how to operate some simple business machines. A farm background is preferred.

The primary requirement for the entry job of LIVESTOCK HANDLER is the ability to handle livestock and a general knowledge of animal characteristics and behavior. This knowledge is usually gained in working with livestock on a farm. As a worker becomes more experienced he may move up to RINGMAN, then to WEIGHMASTER. With some special training he can become an AUCTIONEER and perhaps finally a MANAGER.

The AUCTIONEER attends a special school for two to four weeks to learn the skills involved. If successful in judging the quality of livestock and in the supervision of personnel he may qualify for a MANAGER position. In many cases an AUCTIONEER will be responsible for several auction market locations, rotating among them on sale days. This may also be true for the MANAGER.

VII. SOIL CONSERVATION SERVICE

This photo shows good examples of soil and water conservation practices for farmland.

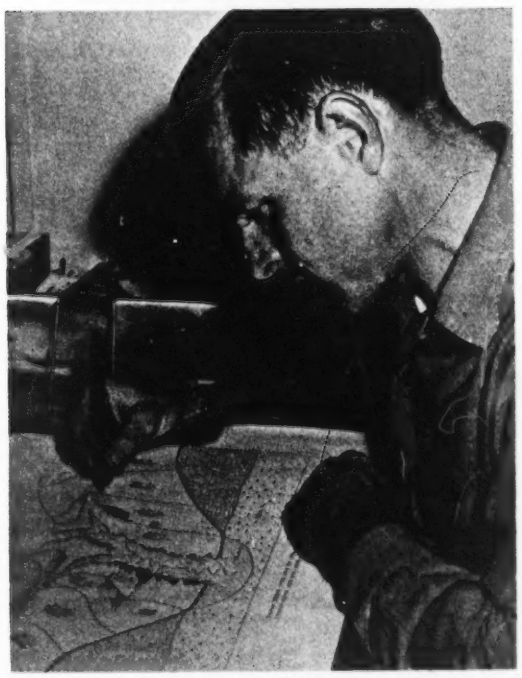
INTRODUCTION Over a period of time man ignorantly altered the natural contours of the land in our country. Very serious soil disturbances resulted and eventually it became obvious that protective soil practices would have to be initiated to save the soil from total ruin. An Act of Congress in 1935 established the Soil Conservation Service to provide technical assistance and instruction to private and public groups to carry out soil and water conservation practices. Today the S.C.S. employs skilled personnel encompassing a wide variety of interrelated natural resource areas including agronomy, forestry, geology, soil science, and others.

ORGANIZATION Each state has a State Conservationist who heads the state S.C.S. He has a number of persons on the state staff who are specialists in areas of importance in the state. The state is divided into areas which are comprised of a number of counties. Each area is headed by an Area Conservationist. Each area is in turn divided into districts which usually correspond to individual counties. Each is headed by a District Conservationist. Each district has a staff of various specialists to fill the particular needs of the district. There may be SOIL CONSERVATIONISTS, SOIL CONSERVATION TECHNICIANS, SOIL SCIENTISTS, ENGINEERS, ENGINEERING TECHNICIANS, ECONOMISTS, BIOLOGISTS, GEOLOGISTS, and AGRONOMISTS.

OUTLOOK In the future it is expected that the S.C.S. will provide services to metropolitan clients. Basic and detailed data will be provided to governmental and private planners for land use planning purposes. New areas of natural resource problems will be handled by the S.C.S. such as water and soil conservation problems in recreational areas caused by human use and abuse, air and water pollution, land use competition requiring economic and physical considerations, sprawling housing developments, restoration of scarred lands, and soil and water problems caused by superhighway and interchange masses of concrete.

The SOIL CONSERVATIONIST in the future will need a greater knowledge of economics, the social and political sciences, ecology, and interpersonal relations to better understand the effects of conservation practices and to be better able to advise and assist interested persons and groups. To assist him he will have new equipment and techniques for communications, data processing, weather modification, and aerial photography by satellites.

Soil Conservationist at right.



A Soil Scientist mapping soils.

JOBS AND PROCESSES

In general, a SOIL CONSERVATIONIST analyzes conservation problems and recommends a planned program for the land to the landowner. Beyond this he gives technical advice on the installation of the conservation measures recommended such as terracing, strip-cropping, or planting of grasses, trees or wildlife food and cover. In addition, he also helps local organizations in flood prevention measures, fish and wildlife development, recreation, and agricultural and municipal water supplies in watersheds by recommending problem solutions and planning conservation and development projects.

The primary duty of the SOIL CONSERVATION TECHNICIAN is to assist the SOIL CONSERVATIONIST. He will do this by assisting in surveys, planting trees, grasses and other plants, collecting soil samples, making maps, and inspecting project construction. In cases where manpower shortages exist, he may actually fulfill the duties of the SOIL CONSERVATIONIST where he is experienced enough to do so.

The SOIL SCIENTIST provides information on soils that is needed for land use planning by landowners, engineers, planning and zoning bodies, builders, and others. He examines the soil to identify the physical and chemical characteris-

tics and classifies them according to their capabilities. He also predicts yields of crops under defined management systems, forecasts behavior of soils in relation to engineering projects, and prepares guides relating soil mapping to soil management practices. Some work in the laboratory where they analyze soil, water, and plant materials to determine their physical and chemical properties.

AGRICULTURAL and CIVIL ENGINEERS work together to design and supervise construction of dams, spillways, drainage and irrigation systems, and other water use systems. They make hydrologic studies of runoff, rainfall, and effects of land use in relation to water supplies.

In the lab they supervise tests to determine requirements for construction of earthfill dams and related engineering works. They also supervise the compilation and reproduction of maps, charts, and photos for use in planning and engineering.

Engineering Technicians surveying.

A Soil Scientist gathering data for mapping as on previous page.

ENGINEERING TECHNICIANS perform technical work in support of the Engineers. They test engineering materials and equipment, perform calculations, set up and operate lab equipment, and prepare technical reports, plans and estimates. In some instances experienced TECHNICIANS may perform the duties of the Engineer if necessary.

ECONOMISTS assist in the planning of watersheds, river basins, and other natural resource areas. They make estimates of the benefits and costs of the improvements, allocate costs, and determine the justification of plans for flood prevention, irrigation, water supply, recreation, and other projects.

Engineers drawing plans.

BIOLOGISTS guide the other staff members and train them in biological principles and practices that make farm land and water more productive of wildlife and fish. They develop and interpret new knowledge and make recommendations on fish and wildlife for use by S.C.S. personnel and landowners.

AGRONOMISTS provide technical information and assistance to S.C.S. personnel and to landowners in carrying out soil and water conservation programs. They interpret soil and crop experimental data for use in planning, conduct field tests to evaluate usefulness of various grasses and legumes in soil conservation, and determine methods of establishing vegetation for conservation purposes.

Agronomist checking an experiment.

GEOLOGISTS investigate and interpret surface and subsurface conditions in relation to design and construction of engineering structures; ground water supply, management, and recharge; sediment yield sources, damage, and control.

ENTRY LEVEL QUALIFICATIONS — The basic qualification for these jobs is a college degree with a major in an area related to conservation such as soil conservation, agronomy, engineering (civil or agricultural), biology, soils, forestry, farm management, range management, animal husbandry, agricultural economics, or other agricultural sciences. Once hired, additional, specialized training is given both on-the-job and in group training centers.

There is a program for college students in which the S.C.S. hires qualified students with majors in the above areas after their freshman year. They work for S.C.S. during the summers to gain experience, determine specialization preferences, and get an idea of pertinent courses to take upon returning to classes. After graduation these student trainees can be assigned to full-time positions without any further civil service testing.

VIII. SOIL TESTING

INTRODUCTION Soil testing as a practice is made up of two component parts, soil sample taking and soil sample analysis. The purpose is to determine the fertility needs of an area of land, say a field, by determining the amounts of critical elements present by chemical analysis of a sample taken from the designated area. Critical elements are those required by plants to grow abundantly such as phosphorus, potassium, calcium, magnesium, and boron. The pH levels of organic matter are also determined.

Samples must be taken carefully to truly represent the total soil conditions. An acre of soil to plowing depth weighs about one thousand tons, yet less than one ounce is used in the lab for analysis.[1/] The analysis procedures have been carefully developed and tested to yield accurate results from this small sample correctly taken.

ORGANIZATION Soil testing establishments are typically small, having only a couple of employees and little division of labor. The work of the larger establishments, which have some division of labor, can be divided into three levels, supervisory, technical, and elemental. The LAB MANAGER or Supervisor is ordinarily an expert on soils and their composition. He assigns the duties of the other workers and solves any problems that may arise. The technical work is done by the SOIL TESTER who does the final analysis of the soil using sophisticated equipment. The LAB TECHNICIAN prepares the soil samples for analysis and does some of the elemental analysis. The soil samples are not taken by soil testing lab personnel.

OUTLOOK Soil testing has a definite role in the future of agricultural production. In present and future times of tight margins, farmers will want to continue to increase production per acre. One way of doing this is to fertilize. Yet it is possible to overfertilize and spend money on extra fertilizer that doesn't yield proportionately greater results. With the number of nutrients required, it is also possible to apply the wrong type of fertilizer. For these reasons it will become increasingly important for farmers to know the exact composition and fertility needs of their soils.

To meet these requirements it is likely that more sophisticated tests will be developed. These will require greater training and skill on the part of the sampling and testing personnel.

1/ E. E. Schulte, H. B. Pionke and L. M. Walsh, Sampling Soils for Testing. Circular 664. Cooperative Extension Programs, University of Wisconsin, Madison, 1968.

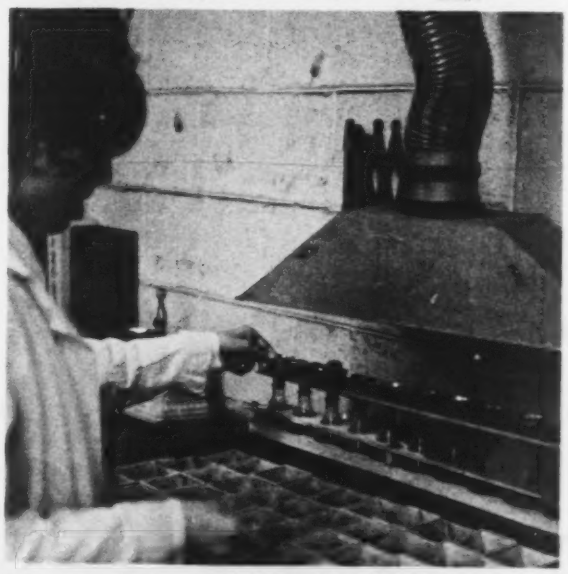
JOBS AND PROCESSES

Before the soil can be tested it must be sampled. Soil samples are taken by a number of people; farmers themselves, fertilizer sales personnel, and various farmer cooperatives offer the service. The SOIL SAMPLER uses a sampling probe or soil auger to remove a core of soil to the depth of plowing. He takes samples that are representative of the field being sampled. This means avoiding low spots, eroded knolls, fertilizer bands and the like. He'll take one composite sample for about each five acres. Each composite is made up of five borings from different areas of the field, as the center and the four corners. Each sample is placed in a bag, identified, and taken or sent to the soil testing lab.

When the samples are received at the lab, the LAB TECHNICIAN checks the information to see that it is complete and consistent on the information sheet. He then pours the individual samples into small, individual boxes in consecutive order for drying. The boxes are placed on trays which are then placed in the drier for two or three days. When the samples are dried they are removed and ground, again in consecutive order to maintain the samples' identity. After grinding, a portion of each sample is measured into a flask into which an extracting fluid is added. The flask is shaken for five minutes before the solution is filtered into funnel tubes.

The LAB TECHNICIAN or SOIL TESTER then conducts a pH test using a pH meter. First he standardizes the meter by inserting the electrode in solutions of known

Grinding the soil sample.



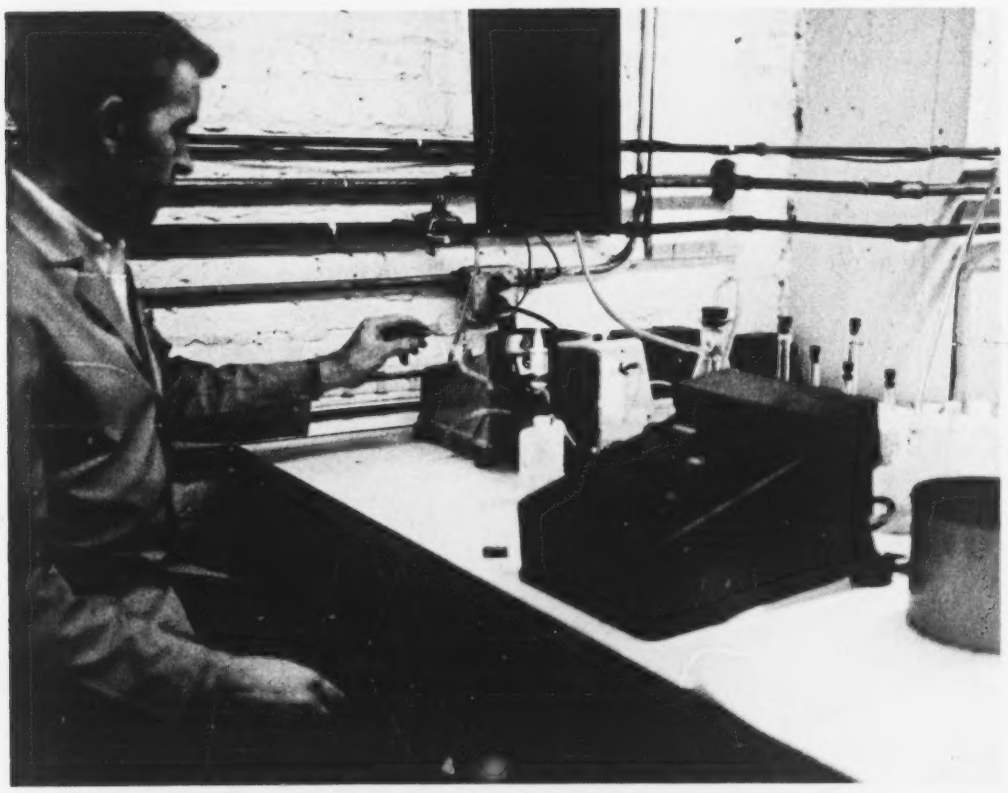
Measuring soil into test flasks.

Adding extraction fluid.

Reading the pH meter (note electrode in first sample).

pH and sets the needle. He then stirs each sample with a glass rod, inserts the electrode in each sample cup in consecutive order, reads the dial, and records the data on the information sheet.

The SOIL TESTER then performs a test for potassium. This is done using a part of the soil solution from above and a flame photometer which uses a gas jet to atomize the solution releasing minute potassium particles which the instrument senses and records on the gauge. For each sample he pours a small amount of solution into the funnel leading to the enclosed flame, reads the amount on the gauge, which is calibrated in pounds per acre, clears the flame with a neutral solution, and records the data on the information sheet.



The Soil Scientist pouring the soil solution into the funnel to the flame causing a color change which is measured and recorded by the device.

The SOIL TESTER then conducts a test for phosphorus. He measures a small amount of soil from each sample into flasks and adds a solution. He then filters the solution into funnel tubes and adds two more solutions. A portion of each sample is then poured into a colorimeter tube which is then placed in a colorimeter. It measures the amount of light passing through the sample which tells the density of the phosphorus. The SOIL TESTER reads the gauge and records the pounds of phosphorus per acre on the record sheet.

The same equipment is used to measure the amount of organic matter. Acid is added to the soil sample to digest it. A solution is then prepared and measured in the colorimeter.

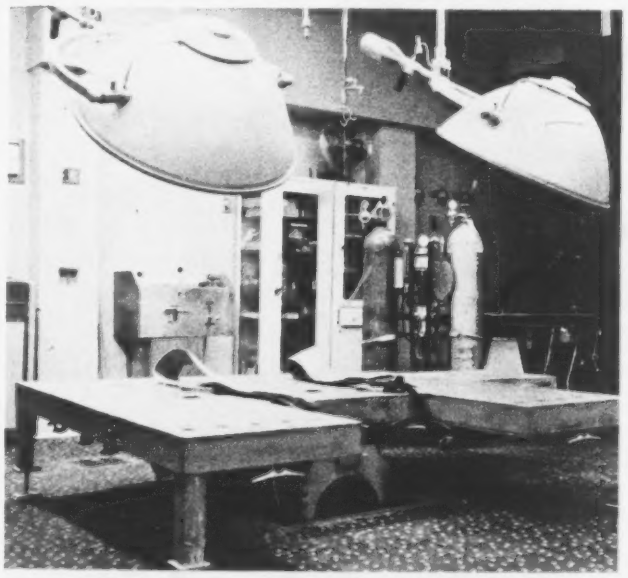
Inserting the colorimeter tube in the colorimeter to register color intensity on scale at top.

Special tests are performed to determine amounts of boron, manganese, zinc, sulphur, soluble salts, and nitrogen, following similar procedures.

ENTRY LEVEL QUALIFICATIONS — Some agricultural experience is preferred for these jobs in order to have gained a general knowledge of soil types and properties. The LAB TECHNICIAN is required to have a high school education. The SOIL TESTER must in addition have college chemistry and some courses in soil science. The LAB MANAGER must have a college degree in soil science or in a related area of agriculture.

IX. VETERINARY MEDICINE

INTRODUCTION Veterinary practices have probably existed since the time man began to domesticate animals. There is little information about this period available, however we can infer that animal diseases and injuries were given attention by the fact that some animals were felt to be sacred, being valued more highly than people. By the time the earliest records were kept there were specialists in both human and animal diseases.1/ Today there are many, many areas of Veterinary medicine. These include such areas as small-animals, public health, research, education, industry, inspection and regulation, and others besides large-animal practice. We'll look only at the large-animal practioner because he most directly serves the farmer. Even within the area of large-animal practice there are numerous areas of specialization. A Veterinarian in Iowa may specialize in hogs, in Wisconsin in dairy cattle; or he may have a mixed practice, depending on the local demands.



Operating room for experimental surgery.

ORGANIZATION A large-animal VETERINARIAN may work individually or with others in a clinic. As an individual he may operate out of his home or office where a Secretary (perhaps his wife) will answer the telephone and relay messages over a two-way radio to his car or truck.

In many cases a number of VETERINARIANS will get together to form a clinic. This has several advantages. It allows them to specialize in separate areas of medicine, to share administrative costs, and to offer their services on a contract basis because one can visit the contract clients while another handles daily emergencies.

OUTLOOK Without a doubt there will continue to be a need for large-animal VETERINARIANS. As the population grows, numbers of large animals to feed it will grow. For them to grow efficiently they will need to have their health attended to by qualified veterinary personnel. New problems will have to be faced by the VETERINARIAN as more animals will be raised in man-made, controlled environments.

1/ Smithcors, J. F., Evolution of the Veterinary Art, Veterinary Medicine Publishing Co., Kansas City, 1957.

Preventive medicine on a contract basis is becoming more popular. When, for example, a dairyman contracts for veterinary care for his herd of cattle the VETERINARIAN visits the farm at regular intervals to perform tests and to administer medical care. The economics underlying this idea is the savings in making only one trip to the farm instead of many, and in detecting health problems before they become serious. A standard fee is then charged for any service rendered.

JOBS AND PROCESSES

Regardless of whether a VETERINARIAN is working independently or jointly, his duties are similar. He travels from farm to farm upon farmer's requests, or according to the contract agreement. Upon arrival he makes a diagnosis of the problem since he has to know what's wrong before he can be of help. The diagnosis is made on the basis of visual inspection of the animal, touching affected areas to feel abnormalities, listening to heart, lung and stomach functions with a stethoscope, and considering the behavior of the animal as described by the farmer.

Checking a calf's heart.

Reading a sow's temperature.

After the symptoms are analyzed the VETERINARIAN determines the cause based on his knowledge gained through academic training and practical experience. Along with the cause he also determines possible treatments. The selection of the treatment to use will depend on the severity of the problem and the value of the animal. He usually consults with the farmer to inform him of the diagnosis, alternative treatments, and their differences. He then includes the farmer's wishes in the selection of the treatment.

Treatment may be relatively simple such as administering a tablet or capsule with a balling gun or giving an injection with a syringe. It may be more complex such as surgery to replace a displaced stomach or to correct other internal disorders. Very complex, expensive treatments may be uneconomical when the value of the animal is considered.

Much of the care administered by the VETERINARIAN is not associated with an illness. This includes assisting in the delivery of a newborn, castration of a male, mending of a break, or treating abrasions.

Along with administering the initial treatment or care, the VETERINARIAN gives the farmer instructions on continuing treatment that he must give. When possible the VETERINARIAN also advises the farmer on ways of preventing recurrence of the problem in the animal or any of the other animals.

Giving a lamb a capsule.

Intravenous injection for a cow.

Administering a tablet to a cow.

ENTRY LEVEL QUALIFICATIONS

A VETERINARIAN has a Doctoral degree in veterinary medicine. This is earned through a four-year preveterinary college curriculum followed by a two-year veterinary curriculum. (Some schools are increasing the latter to three years.) To earn the D.V.M. degree a wide knowledge of chemistry, physiology, anatomy, and other sciences must be gained. A strong liking for animals and a desire to help them and their owners is also needed.

With the VETERINARIAN'S role as a consultant increasing, it is important that he be knowledgeable in such areas as nutrition, genetics, preventive medicine and others that affect the well-being of animals.

A private practice is often not possible immediately for a newly graduated VETERINARIAN. For this reason many start out working for an established VETERINARIAN to gain practical experience and to build up the capital required to buy or begin practices of their own.

JOB INDEX

For use by those who may wish to relate the titles used in this publication to those used in the Dictionary of Occupational Titles.

PLANT TITLE	PAGE	D.O.T. TITLE	D.O.T. CODE
AGRI-BUSINESS AGENT	23	AGRI-BUSINESS AGENT	096.128*
AGRICULTURAL AGENT	24	COUNTY-AGRICULTURAL AGENT	096.128-014
AGRICULTURAL ENGINEER	38	AGRICULTURAL ENGINEER	013.081-010
AGRONOMIST	39	AGRONOMIST	040.081-014
ATTENDANT	3	AUTOMOBILE-SERVICE-STATION ATTENDANT	915.867-010
AUCTION CLERK	34	CLERK, GENERAL OFFICE	219.388-066
AUCTIONEER	34	AUCTIONEER	294.258-010
BIOLOGIST	39	BIOLOGIST	041.081-034
CIVIL ENGINEER	38	CIVIL ENGINEER	005.081-014
CLERK	2	SALESPERSON, GENERAL	289.458-014
CONTINUING EDUCATION AGENT	26	CONTINUING EDUCATION AGENT	096.128*
ECONOMIST	38	ECONOMIST	050.088-014
ENGINEERING TECHNICIAN	38	ENGINEERING TECHNICIAN	040.281*
ENVIRONMENTAL QUALITY AGENT	26	ENVIRONMENTAL QUALITY AGENT	096.128*
FARM EQUIPMENT OPERATOR	4	FARM-EQUIPMENT OPERATOR	409.883-010
FARM MANAGEMENT AGENT	25	FARM MANAGEMENT AGENT	096.128*
FIELDMAN	14	FIELDMAN, D.H.I.A.	469.358*
FIELDMAN	30	FIELD-CONTACT MAN	162.158-082
FIELD TECHNICIAN	11	A.I. FIELD TECHNICIAN	467.354*
FORESTRY AGENT	26	FORESTRY AGENT	096.128*
FOUR-H CLUB AGENT	25	FOUR-H CLUB AGENT	096.128-026
GEOLOGIST	39	GEOLOGIST	024.081-018
HERDSMAN	7	A.I. HERDSMAN I OR	467.134*
		A.I. HERDSMAN II	467.184*

PLANT TITLE	PAGE	D.O.T. TITLE	D.O.T. CODE
HOME ECONOMICS AGENT	24	COUNTY HOME-DEMONSTRATION AGENT	096.128-010
HORTICULTURAL AGENT	26	HORTICULTURAL AGENT	096.128*
LAB MANAGER	8	A.I. LAB MANAGER	467.384*
LAB MANAGER, SOIL	40	SOIL SCIENTIST	040.081-078
LAB TECHNICIAN	8	A.I. LAB TECHNICIAN I OR A.I. LAB TECHNICIAN II	467.387* 467.887*
LAB TECHNICIAN	14	LAB TECHNICIAN	469.384*
LAB TECHNICIAN	41	LAB TECHNICIAN	029.384*
LAB TECHNICIAN, ELECTRONIC	14	LAB TECHNICIAN, ELECTRONIC	469.384*
LABORER	8	A.I. LABORER I OR II	467.887*
LIVESTOCK AGENT	26	LIVESTOCK AGENT	096.128*
LIVESTOCK HANDLER	33	LIVESTOCK CARETAKER, YARD-OR-IN TRANSIT	466.887-010
MANAGER	33	WHOLESALER	185.168-078
MILK HAULER	30	MILK DRIVER	905.883-014
MILLMAN	2	FEED MIXER	520.885-122
MOTORIZED EQUIPMENT MECHANIC	20	FARM EQUIPMENT MECHANIC I	624.281-010
NON-MOTORIZED EQUIPMENT REPAIRMAN	20	FARM EQUIPMENT MECHANIC II	624.381-010
PARTSMAN	20	SALESPERSON, PARTS	289.358-046
QUALITY CONTROL TECHNICIAN	10	A.I. QUALITY CONTROL TECHNICIAN	467.384*
RECREATION AGENT	26	RECREATION AGENT	096.128*
RESEARCH TECHNICIAN	10	A.I. QUALITY CONTROL TECHNICIAN	467.384*
RESOURCE AGENT	26	RESOURCE AGENT	096.128*
RINGMAN	34	LIVESTOCK CARETAKER, YARD-OR-IN-TRANSIT	466.887-010
SALESMAN	3	SALESMAN, FARM AND GARDEN EQUIPMENT AND SUPPLIES	277.358-018
SALESMAN	18	SALESMAN, TRACTOR AND FARM IMPLEMENTS	277.358-026
SET-UP MAN	20	FARM MACHINERY SET-UP MAN	624.381-014
SHIPPING CLERK	10	SHIPPING CLERK II	222.587-042
SOIL CONSERVATIONIST	37	SOIL CONSERVATIONIST	040.081-074

PLANT TITLE	PAGE	D.O.T. TITLE	D.O.T. CODE
SOIL CONSERVATION TECHNICIAN	37	SOIL CONSERVATIONIST	040.081-074
SOIL SAMPLER	41	LABORATORY-SAMPLE CARRIER	922.887-062
SOIL SCIENTIST	37	SOIL SCIENTIST	040.081-078
SOIL TESTER	41	SOIL AND PLANT ANALYST	029.281*
TIRE AND PAINT MAN	20	TIRE REPAIRMAN AND PAINTER, SPRAY I	915.884-014 741.884-026
TRACTOR MECHANIC	20	FARM-EQUIPMENT MECHANIC I	624.281-010
TRUCK DRIVER	3	TRUCK DRIVER, HEAVY	905.883-022
TRUCK DRIVER	20	TRUCK DRIVER, HEAVY	905.883-022
VETERINARIAN	46	VETERINARIAN	073.101*
WAREHOUSEMAN	3	MATERIAL HANDLER	929.887-050
WEIGHMASTER	34	LIVESTOCK CARETAKER, YARD-OR-IN-TRANSIT	466.887-010
YOUTH AGENT	25	FOUR-H CLUB AGENT	096.128-026

* Represents new job or proposed revisions to the Dictionary of Occupational Titles, Third Edition.

PHOTO CREDITS

We gratefully acknowledge the assistance of the following companies in providing photographs for this publication:

American Breeders Service, Inc.
De Forest, Wisconsin
pp. 6, 7, 8 top, 9, 10 middle, 11, and 12.

Agricultural Records Cooperative
Madison, Wisconsin
pp. 14, 15, and 16.

Carnation Breeders Service, Inc.
Watertown, Wisconsin
pp. 8 middle and bottom, 10 top and bottom.

Equity Cooperative Livestock Sales Association
Johnson Creek, Wisconsin
pp. 33, 34, and 35.

F.S. Services, Inc.
Jefferson, Wisconsin and Bloomington, Illinois
pp. 1, 2, 3, and 4.

Hanley Implement Co.
Sun Prairie, Wisconsin
pp. 18, 19, and 20.

Soil Conservation Service
Washington, D.C.
pp. 36, 37, 38, and 39.

United States Department of Agriculture
Washington, D.C.
pp. 17 and 28.

University of Wisconsin
Madison, Wisconsin

Department of Agricultural Journalism
pp. 24, 25, and 26.
Department of Veterinary Science
pp. 44, 45, and 46.
Extension Service
pp. 22, 27, 30, and 31.
Soil and Plant Analysis Laboratory
pp. 41, 42, and 43.

Wisconsin Dairies Cooperative
Baraboo, Wisconsin
p. 29.

Agricultural Service Jobs is the second publication in a series on jobs in the Agriculture and Agricultural Services Industry. The first, Beef and Dairy Cattle Raising Jobs, describes jobs in the areas of milk and beef production in the Midwest. Future publications are expected to cover such areas as the raising of fruits and vegetables, sheep, poultry, hogs, and various field crops.

Back cover illustration reprinted from the Farm Index, U.S.D.A., December, 1969.

6000—27